Environmental Assessment

EA ID-074-02-067

INEEL

Sagebrush Steppe Ecosystem Reserve

Management Plan

CONTENTS

TABLES

Maps

The following maps are located inside the back cover:

ACRONYMS

AUM	Animal Unit Month
BLM	U.S. Department of Interior, Bureau of Land Management
CEQ	Council on Environmental Quality
CFA	Central Facilities Area
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy at INEEL
EA	Environmental Assessment
ESA	Endangered Species Act
FWS	U.S. Department of Interior, Fish and Wildlife Service
GIS	Geographic Information Systems
INEEL	Idaho National Environmental and Engineering Laboratory
IDF&G	Idaho Department of Fish and Game
IWM	Integrated Weed Management
MIST	Minimum Impact Fire Suppression Tactics
NEPA	National Environmental Policy Act (1970)
NERP	National Environmental Research Park
ROW	Right of Way
TAN	Test Area North
USGS	U.S. Department of Interior, Geological Survey
WRRTF	Water Reactor Research Test Facility

INEEL Sagebrush Steppe Ecosystem Reserve Management Plan

1. INTRODUCTION

The **Idaho National Engineering and Environmental Laboratory Sagebrush Steppe Ecosystem Reserve (Reserve)** was established in 1999 by the then Secretary of Energy, William Richardson. In the establishing Proclamation for the Reserve, the Secretary recognized that the *"Reserve is a valuable ecological resource unique to the intermountain west and contains lands that have had little human contact for over 50 years. The Sagebrush Steppe Ecosystem across its entire range was listed as a critically endangered ecosystem by the National Biological Service in 1995, having experienced greater than a 98% decline since European Settlement.…Conservation management in this area is intended to maintain the current plant community and provide the opportunity for study of an undisturbed sagebrush steppe ecosystem...Traditional rangeland uses, which currently exist on a portion of the area, will be allowed to continue under this management designation*." This proclamation was co-signed by representatives of the Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (FWS), U.S. Department of Energy (DOE-ID) and Idaho Department of Fish and Game (IDF&G). The Reserve location is shown in Map 1 and the complete proclamation is contained in Appendix 1.

Approximately 40% of the 890 square miles of the Idaho National Engineering and Environmental Laboratory (INEEL) has not been grazed by livestock for the past 50 years, with the balance receiving minimal human influence during that time. This has allowed plant communities to develop into conditions that approximate those that existed prior to European settlement. This is the largest non-grazed reserve of sagebrush steppe in the region, once the most extensive semi-desert vegetation type of the Intermountain West (West, 1988). Recognition of the importance of these communities also resulted in designation of the INEEL as the second of the DOE's National Environmental Research Parks (NERPs) in 1975. This area offers research opportunities rarely found elsewhere.

This document has been produced by an interdisciplinary team representing DOE-ID, Bechtel-BWXT, FWS, IDF&G, the Shoshone Bannock Tribes and BLM, with funding provided primarily by the DOE.

1.1 Purpose and Need

The purpose of this Environmental Assessment is to: 1) Develop resource specific goals and objectives based upon the broad objectives set forth in the Proclamation, 2) meet the requirements of the National Environmental Policy Act by developing and analyzing alternative management scenarios for achieving those goals and objectives, and 3) establish mechanisms for long-term management of the Reserve.

Throughout the Intermountain Region, low elevation sagebrush steppe communities have, and are being, widely degraded or converted to other uses such as farmlands, grasslands, urban areas and highways. In addition, spread of annual grasses and concurrent changes of fire regimes are threatening remaining communities. Approximately 1% of historic sagebrush communities in the west remain relatively unchanged from their pre-European settlement condition (Hironaka et al., 1983; Quigley and Arbelbide, 1997; Noss et al., 1995; West, 1999) and populations of wildlife species dependent upon them are declining. The declines in sage grouse and other sagebrush obligate wildlife species have focused attention on the need for protection of remaining intact habitat necessary for species survival.

Opportunities to conduct research within minimally altered sagebrush communities may be critical to the survival of many of these species.

1.2 Management Goals and Objectives

The following were developed from the general guidance contained in the Proclamation. These are intended to provide a framework for maintaining the long-term health of the increasingly rare resources found on the Reserve.

Mission Statement: The INEEL Sagebrush Steppe Ecosystem Reserve shall be managed as a laboratory where all native ecosystem components, cultural resources and Native American Tribal values are conserved. Management will concentrate on providing opportunities for scientific investigation of the resources present on the Reserve.

Management Goal 1: Establish a baseline of resource data to identify and prioritize immediate needs for management adjustment.

Objective 1a: By September 2004, identify biological, cultural and tribal resources at risk, and immediate inventory needs.

Objective 1b: By September 2004, identify immediate management adjustments needed for protection of resources at risk.

Management Goal 2: Provide for long-term resource management, plan implementation and development of educational opportunities.

Objective 2a: By September 2004, develop an Implementation Plan for the management provisions identified herein.

Objective 2b: By September 2004, begin identifying funding sources to support implementation of future management actions and plan implementation.

Objective 2c: By September 2005, develop a Monitoring Plan that would address long-term monitoring needs and protocols for all significant resources on the Reserve.

Objective 2d: By September 2005, develop an Educational Outreach and Resource Interpretation plan.

Objective 2e: Adjust all activities as necessary to protect native plant communities, native wildlife habitat, and cultural and tribal resources. Achievement will be measured by reductions of invasive plant infestation acreage and numbers of cultural and tribal sites avoided.

Management Goal 3: Restore degraded ecological resources.

Objective 3a: Develop and conduct site-specific restoration plans for those areas identified as needing restoration by September 2006.

Management Goal 4: Facilitate and manage scientific research.

Objective 4a: By September 2004, develop a Research Facilitation and Management Plan for the Reserve.

Objective 4b: By September 2005, catalogue all existing research and resource data.

1.3 Funding and Plan Implementation

Implementation of selected management actions and achievement of the target dates contained in the objectives are heavily dependent upon future funding allocations. The interagency nature of management and regional significance of the Reserve broadens the potential for funding beyond any one of the cooperating agencies. The Sagebrush Steppe Ecosystem Reserve Long Term Management Committee (Reserve Management Committee) would likely be required to develop innovative funding sources to achieve plan implementation in a timely manner.

1.4 Management Issues

During the Spring and Summer of 2002, comment was received from County Commissioners, the Shoshone Bannock Tribal Council and the general public at open houses held at Idaho Falls, Fort Hall, Arco, and Mud Lake. The following issues were identified for consideration during preparation of this management plan, based upon public comment and agency review.

Protection of plant communities and wildlife habitat: Viable wildlife populations are dependent upon maintaining diverse, healthy plant communities, maintaining or improving connectivity within habitats, and improving degraded habitats. Management for protection of these resources may require changes to multiple use activities, access to the Reserve, and fire suppression and reclamation procedures.

Protection of special status plant and wildlife species: Several plant and animal species on the Reserve require special attention for research and management. These species include those listed under the Endangered Species Act (ESA), those on State or Federal Sensitive Species lists, sagebrush obligate species, and species culturally important to Indian Tribes.

Management of livestock grazing: The Reserve contains portions of four BLM grazing allotments important to the local economy. Livestock distribution is controlled by herding of sheep and water placement for cattle. With limited allotment boundary fencing, livestock often trespass onto other allotments and the portions of the Reserve closed to grazing.

Wildfire management: Wildfire has been increasing in the Snake River Plain. While no recent fires have occurred on the Reserve, fire is all but certain in the future. Fire may affect Reserve values in many ways, but the removal of sagebrush from large areas is potentially the most significant. Fires also lead to high rates of wind erosion and dust affecting INEEL facilities. A variety of fire suppression techniques are available, some of which may be less effective at stopping fire, but leave smaller impacts to surface resources when used.

Roads: The Reserve contains approximately 259 miles of roads that are available only for DOE-ID authorized uses. Public access to the INEEL is limited to protect site security and public safety. Some areas are open to big game hunting and access across the INEEL to BLM and USFS lands is also allowed. Roads, and their use, can pose numerous conflicts with the management goals of the Reserve.

Air quality: Air quality on the Reserve is most affected by smoke from wildfires and dust produced by wind erosion following fires and other soil disturbance. Most soils are highly susceptible to wind erosion, with very high levels of particulate matter being measured following wildfires.

Invasive, non-native plant species: Invasion by noxious weeds and other invasive plants pose a significant threat to the native ecosystems of the Reserve. While noxious weeds have a large potential for expansion, cheatgrass invasion, with its potential to increase fire frequency, is a large threat. In addition, crested wheatgrass, once seeded for reclamation, is also invading adjacent native plant communities.

1.5 Conformance with Existing Plans and Regulations

Designation of the Reserve is consistent with the 1975 designation of the INEEL as a National Environmental Research Park (NERP). This designation recognized the unique opportunities for research that exist on the protected lands that act as buffers around INEEL facilities. The objectives of the NERPs are to conduct research and educational activities concerning the environmental consequences of energy use and weapons development, educating the public on environmental and ecological issues, and to set aside and characterize research reference areas (DOE 1994).

A large body of law applies to management of the various resources on the Reserve. Management actions proposed and conducted will comply with these and any amendments that may come in the future.

2. MANAGEMENT ALTERNATIVES

Section 102 (2)(E) of National Environmental Policy Act (NEPA) states "the Federal Government shall study, develop, and describe appropriate alternatives to the recommended courses of action in any proposal which involves unresolved conflicts considering alternative uses of available resources." A Proposed Action and three alternatives were designed using the following scenarios:

Alternative 1: (The Proposed Action) The course of action recommended by the interdisciplinary team as the best compromise between protecting ecological resources and allowing for continuation of authorized uses on the Reserve.

Alternative 2: (No Action) The management direction that now exists for the Reserve.

Alternative 3: This alternative was formulated to maximize the protection of natural resource values, choosing the most precautionary measures to protect those values.

Alternative 4: This alternative allows for maximum opportunity for use of the natural resources available for development, as limited by the Goals and Objectives for the Reserve.

2.1 Management Direction Common to all Alternatives

Most natural resource allocations are governed by laws and regulations. For some programs, such as management of species listed under the ESA, Cultural Resources and Native American Tribal Values, these laws allow for no viable management alternatives different from current guidance. Management of Long-Term Stewardship may change from the current situation due to Reserve specific guidance developed in this plan. All action alternatives and environmental effects are the same for these programs.

Roads

Access for all research projects would be reviewed on a case-by-case basis by the Reserve Management Committee. The committee would evaluate potential impacts to ecological resources and recommend specific routes and time limitations as necessary.

Native American Tribal Values

The four agency stewards and the tribes would work together to communicate, understand and manage for tribal values and perspectives.

Long-Term Management, Public Outreach, and Research

One of the key provisions of this plan is the establishment of a Reserve Management Committee. This committee would be created by Memorandum of Understanding and include representatives of DOE-ID, BLM, USF&W, IDF&G, higher education and Shoshone-Bannock Tribes. Functioning of this committee is important to the success of the provisions of this plan and the long-term management of the Reserve.

This committee would:

- Oversee research, data management and information sharing.
- Oversee management of ecological and cultural resources.

- Coordinate with the INEEL Long-Term Stewardship Program and Wildland Fire Management Committees.

Wildfire

1. The INEEL has recently established a Wildland Fire Management Committee to provide recommendations to the DOE-ID Operations Office manager for pre- and post-fire activities and to facilitate implementation of these activities. The committee consists of experts in cultural resources, threatened and endangered species, vegetation, wildlife, soils, watersheds, air, the Sagebrush Steppe Reserve, the NERP, NEPA, Fire Marshall, Fire Department, Geographic Information Systems and INEEL Infrastructure.

2. The following fuel management zones are managed for reduced fuel loads.

    - Annual mowing is conducted a minimum of 10-ft and maximum of 50-ft.on each side of all paved roads (State Highways 22, 28, and 33 and Lincoln Boulevard).

    - Mow 5- to 10-ft around WRRTF, with no blading, sterilization or gravel placement being allowed.

    - No fuel management will be conducted along unimproved roads.T-9 and existing power line roads would be maintained as passable for 4X4 access.

2.2 Alternative 1: The Proposed Action

Lands and Minerals

1. Development of new mineral material quarries within the Reserve would no longer be allowed with the exception of the previously permitted clay sources at the Water Reactor Research Test Facility (WRRTF).

2. Development of new utility rights-of-way (ROWs) would not be allowed outside of the State highway ROWs.

3. Existing ROWs and abandoned gravel pits would be inventoried for conflicts with the goals of the Reserve and restored as necessary. Existing ROWs would remain in place.

Roads

1. All non-paved roads and trails within the Reserve would be designated as either open to all authorized vehicles or open to only authorized research vehicles. Under this alternative approximately 105 miles would remain open for all authorized vehicles and 154 miles open to authorized research vehicles only, as shown Map 2.

2. Routes open to all authorized vehicles would be designated with signs and others would have use tightly controlled by the Reserve Management Committee. All research proposals would be reviewed, with access allowed via specific routes that minimize impacts to ecological resources.

3. Routes available for all authorized vehicles would include: access to BLM and National Forest land in the Lemhi Mountains, all INEEL maintenance priority 1, 2, and 3 roads, the Breeding Bird

survey route, necessary access for livestock management and routes to groundwater monitoring wells.

4. Only routes designated as open to all authorized vehicles would be available for public hunting access in the portion of the Reserve now open to hunting.

Noxious and Invasive Plants

1. Implement an Integrated Weed Management Plan (IWM) for the Reserve. IWM consists of actions taken in 4 phases. Phase 1: education, inventory, impact assessment; Phase 2: prioritizing weed problems, choosing and implementing management techniques; Phase 3: adopting proper grazing management; Phase 4: evaluation of management practices (Sheley et al., 1999).

2. All off-road, fire control and construction vehicles entering the Reserve would be routed though the bus washing station at the Central Facilities Area (CFA) to have their undercarriages washed with high-pressure equipment to remove soils potentially containing noxious weed seeds.

3. Areas along roadsides and trails, and around INEEL facilities would be evaluated for undesirable plant encroachment into adjacent native plant communities and treated as necessary. This would include noxious weeds, invasive annual species and crested wheatgrass stands.

Revegetation Project Guidance

1. Only locally collected seed and/or transplants would be used for reestablishment of the perennial plant community.

2. Under special circumstances, other species would be allowed as determined by the Reserve Management Committee following site-specific evaluation.

Livestock Grazing

1. The following requirements would be added to the existing Terms and Conditions applied to each grazing permit.

    - All supplemental feed brought onto the Reserve would be certified weed free.
    - No change in class of livestock would be considered for each allotment
    - No increases in stocking levels would be considered.

2. Each livestock concentration area would be evaluated on a case-by-case basis to determine needs for restoration.

3. 12.4 miles of boundary fence would be constructed along the north and east sides of the Wigwam Butte Allotment. The fence would extend from the eastern end of the existing fence, to and along, State Highways 22 and 33 to the western boundary of the INEEL and be set back a minimum 200 yards from the highways

4. No construction of water wells would be considered for livestock watering purposes.

Wildlife Habitat

1. All unused power poles would be removed.

2. Active power line systems would have devices installed to make the towers and poles un-useable as perches by raptors.

3. Native plant communities would be restored as necessary.

Surface Water

If a portion of the water from the Birch Creek Hydropower diversion becomes available for use on the Reserve, the water would be returned to the Birch Creek channel. Native riparian plants would be reestablished within the newly created riparian areas as necessary.

Wildfire Management

Fire Suppression

When fires burn under severe conditions, Incident Commanders (ICs) have discretion to use any and all tactics allowed in the INEEL Wildland Fire EA. When fires burn under less severe conditions, fire suppression tactics would be selected from the following prioritized list. The overall objective would be to stop fires using the least impacting method.

1. A Resource Advisor, knowledgeable of the Sagebrush Steppe Ecosystem Reserve management objectives, would be assigned to each fire on, or approaching, the Reserve at the initial attack stage

2. Aerially applied retardant for containment line construction and fire suppression

3. Allow fires to burn to natural or existing man-made barriers rather than creating newly constructed line

4. Use hand-constructed line with cold-trail tactics

5. If containment lines are used, they would be located to minimize burning of sagebrush stands and direct impacts to sagebrush by line construction

6. Use of dozers or graders would require concurrence from the Chairman of the Reserve Management Committee, or designate, prior to their use

7. Bladed containment lines would be located on existing roads where possible

8. Construct newly bladed containment line using minimum width and depth to check fire spread. Locate lines to minimize impact to drainages, sagebrush stands, and cultural/tribal resources

9. Avoid burning-out unburned pockets of vegetation within containment lines, unless absolutely necessary

10. Use indirect tactics to safely locate containment lines and burn out fuels between the line and fire.

Fire Mop-up

1. Islands of unburned vegetation within containment lines would not be burned out

2. Restrict soil disturbance to hot areas near containment lines only

3. Cold-trial interior hot spots to protect residual vegetation.

Fire Restoration

After every fire on the Reserve, the Reserve Management Committee, in conjunction with the INEEL Wildland Fire Management Committee, would conduct evaluation of fire and fire suppression impacts to natural and cultural resources and provide long-term monitoring, mitigation and restoration recommendations using the following guidelines:

1. Restoration would generally be limited to areas where vegetation was destroyed by suppression activities

2. Use only locally collected native seed or transplants and certified weed free materials for mulching

3. Minimizing off-road vehicle use of the burned area

4. Monitor affected areas twice monthly during the first growing season for presence of noxious weeds.

2.3 Alternative 2: No Change in Management Direction

Lands and Minerals

1. Development of new sand and gravel quarries within the Reserve is considered on a case-by-case basis. One 200 acre clay source has been permitted near WRRTF.

2. New ROW's are considered on a case-by-case basis.

Roads

1. Roads and tracks are all available for use by authorized vehicles.

2. All roads are maintained as necessary.

3. Access for big game hunting is allowed on established roads that have not been closed by DOE-ID on a portion of the Reserve north of Highway 33, west of Highway 22, south and west of the Kyle Canyon Road.

Noxious and Invasive Plants

Noxious weeds are treated as INEEL budgets allow.

Revegetation Project Guidance

Current guidance for revegetation at the INEEL is contained in Anderson and Shumar (1989) as amended. This guidance limits revegetation species to the native species included in Table 2 of the document. Use of commercially available cultivars of these species is allowed.

Livestock Grazing

Among others that do not affect this plan, existing Terms and Conditions applied to each grazing permit currently are:

1. Allotments must meet requirements of 43 CFR 4180, Fundamentals of Rangeland Health.

2. Utilization of key upland species shall be no more than 50% of the annual growth.

Wildlife Habitat

The abandoned power line along Lincoln Boulevard has a total of 16 poles, two of which have nesting platforms attached.

Surface Water

As shown in Map 7, out-flows from the Birch Creek Hydroelectric plant flow through a small portion of the Reserve and into the T-28 North gravel pit which is off of the Reserve.

Wildfire

DOE-ID recently completed the NEPA process evaluating fire management options (DOE/EA-1372) for the INEEL. The Finding of No Significant Impact (FONSI) was signed on April 24, 2003. The management actions selected in the FONSI are the existing fire management guidance for the Reserve.

Staged Fire Response

1. The INEEL will use a staged response and incorporate MIST whenever conditions allow.

2. No Resource Advisors are assigned to fires.

Minimum Impact Suppression Tactics (*MIST*)

In Light fuels:

1. Construct containment lines using water or foam and cold-trail tactics

2. Allow fires to burn to natural barriers

3. When using mechanically constructed containment lines:

4. Use minimum width and depth to check fire spread

5. Use Tilted blades

6. Use parallel tactics to minimize containment lines

7. Place containment lines to minimize impact on significant environmental resources including waterways, draws, and sagebrush stands.

In Medium to Heavy Fuels:

1. Allow use of natural barriers and cold-trailing.

2. Cool with dirt and water and cold-trailing

3. When using mechanically constructed containment lines

    - Use minimum width and depth to check fire spread
    - Use Tilted blades
    - Use parallel tactics to minimize containment lines
    - Place containment lines to minimize impact on significant environmental resources including waterways, draws, and sagebrush stands.

Conventional Fire Suppression Tactics

Direct suppression:

1. Hose line application of water and/or foam from off road fire-fighting equipment

2. Aerial delivery of water and/or chemical retardant using helicopters and air tankers

3. Construction of containment lines up to 24 feet wide on the fire perimeter using dozers, graders and discs.

Indirect suppression:

1. Construct containment lines ahead of advancing fire. Generally using dozers, graders or discs for lines up to 24 feet wide or widening of existing breaks.

2. Pockets of unburned vegetation within the fire perimeter would be preserved to the extent practical.

Parallel suppression:

1. Construct containment lines parallel to, but further from the fire than in indirect attack

2. Burn out fuels between containment lines and the fire

3. Construct containment lines to effectively control the fire.

Post-Fire Actions for Dust Suppression

1. Application of chemical soil tackifier and/or mulch

2. Installation of water cannons or snow fences upwind of affected facilities.

Post Fire Mop-up

1. Use cold-trail tactics adjacent to unburned fuels, including interior pockets to detect hot areas.

2. Restrict soil-disturbing activities to hot-spots near containment lines.

3. Use thermal detection devices along perimeter to detect hot-spots.

Site Restoration

1. Site-specific analysis to determine needs.

2. Recontour areas disturbed during suppression actions.

3. Use native species preferred, but use of commercially available cultivars of these species is allowed.

2.4 Alternative 3: Emphasize Natural Resource Protection

Lands and Minerals

This alternative contains the same management direction as proposed for Alternative 1.

Roads

1. All non-paved roads and trails within the Reserve would be designated as either open to all authorized vehicles or open to only authorized research vehicles. As shown in Map 3, this alternative proposes approximately 84 miles to remain open for all authorized users and 165 miles open to authorized research vehicles only as shown on map 3

2. Routes open to all authorized vehicles would be designated with signs and others would have use tightly controlled by the Reserve Management Committee. All research proposals would be reviewed with access allowed via specific routes that minimize impacts to ecological resources.

3. Routes available for all authorized vehicles, would include: access to BLM and National Forest land in the Lemhi Mountains, all INEEL maintenance priority 1, 2, and 3 roads, the Breeding Bird survey route, necessary access for livestock management and routes to groundwater monitoring wells.

4. Only routes designated as open to all authorized vehicles would be available for public hunting access in the portion of the Reserve now open to hunting.

Noxious and Invasive Plants

This alternative contains the same management direction as proposed for Alternative 1.

Revegetation Project Guidance

This alternative contains the same management direction as proposed for Alternative 1.

Livestock Grazing

1. All of the management actions proposed in Alternative #1.

2. Opportunities for purchase, retirement or relinquishment of grazing permits would be pursued from operators willing to sell.

Wildlife Habitat

This alternative contains the same management direction as proposed for Alternative 1.

Surface water

If a portion of the water from the Birch Creek Hydropower diversion becomes available for use on the Reserve, the water would be returned to the Birch Creek channel at as many separate locations as feasible. Map 4 displays potential water return points based upon GIS map data. Native riparian plants would be reestablished within the newly created riparian areas as necessary.

Wildfire

This alternative contains the same management direction as proposed for Alternative 1.

2.5 Alternative 4: Emphasize opportunity for Resource Development

Lands and Minerals

1. Development of new sand and gravel quarries and ROWs would be considered on a case-by-case basis.

2. Existing ROWs and abandoned gravel pits would be inventoried for conflicts with the goals and objectives of the Reserve and restored as necessary.

Roads

This alternative contains the same management direction as currently exists under Alternative 2.

Noxious and Invasive Plants

Implement an IWM Plan for the Reserve. This would include an extensive weed inventory, application of biological pest controls where appropriate, chemical weed control where appropriate, reduction of spread vectors, education of INEEL staff, and coordination with the Continental Divide Cooperative Weed Management Area.

Revegetation Project Guidance

This alternative contains the same management direction as proposed for Alternative 1.

Livestock Grazing

1. Increase livestock stocking to the full preference of Animal Unit Months (AUMs) for each allotment. This is the amount of grazing allotted during grazing district adjudication in the 1960s.

2. To accommodate the increased grazing on the cattle allotments (Sinks and Wigwam Butte), operators would be required to herd cattle to control utilization and distribution. Livestock movement would be based upon monitoring data with maximum utilization levels set to achieve Reserve Management Goals and Objectives.

3. The boundary fence along the north and east sides of the Wigwam Butte Allotment would be extended as under Alternative 1.

Wildlife Habitat

1. All unused power poles would be removed.

2. No active power lines would be modified to eliminate raptor perching.

Surface Water

This alternative contains the same management direction as proposed for Alternative 1.

Wildfire

Alternative 4 contains the same management direction as Alternative 2, with the addition of requiring Resource Advisors be assigned to all fires on or threatening the Reserve.

Table 1. Summary of management alternatives.

Program	Alternative 1: Proposed Action	Alternative 2: No Action	Alternative 3: Emphasize Resource Protection	Alternative 4: Emphasize Opportunity for Resource Development
Lands and Min.				
1. Gravel pits	1. No New Development, allow currently permitted clay pit	1. Allowed.	1. Same as #1	1. Same as #2
2. ROW's	2. No New Development.	2. Allowed	2. Same as #1	2. Same as #2.
3. Existing ROW's and gravel pits	3. Inventory and repair where conflicts exist.	3. Monitored for stability	3. Same as #1.	3. Same as #1.
Roads				
1. Open to all authorized uses	1. 95 miles	1. 259 miles	1. 84 miles	1. 259 miles
2. Open for authorized 'authorized research only'	2. 154 miles	2. 259 miles	2. 165 miles	2. 259 miles
3. Road maintenance	3. Controlled by Reserve Mgt. Committee	3. All roads maintained as necessary.	3. Controlled by Reserve Mgt. Committee	3. All roads maintained as necessary.

Table 1. (continued).

Program	Alternative 1: Proposed Action	Alternative 2: No Action	Alternative 3: Emphasize Resource Protection	Alternative 4: Emphasize Opportunity for Resource Development
Weeds 1. Control 2. Vehicles 3. Seeded Areas	1. IWM 2. Specific high risk types washed at bus garage 3. Evaluated for conflicts	1. Limited spraying. 2. No controls 3. No evaluation	1. IWM 2. Same as #1 3. Same as #1.	1. IWM 2. Same as #2 3. Same as #2
Revegetation Direction	Only local genotypes of native species.	Allows for mixtures of native species and commercially available cultivars of these species.	Same as #1.	Same as #2
Livestock 1. Supplemental feed. 2. Stock concentration areas 3. Fencing 4. Class of livestock 5. Stocking	1. Cert. Weed Free 2. Inventory for remedition 3. Eastern and southern boundaries of Wigwam Butte fenced 4. No changes 5. No increases	1. No limits 2. No limits 3. Current partial fence between Wigwam Butte and Mahogany 4. May be changed after NEPA analysis 5. May be changed after NEPA Analysis.	All limitations in Alternative 1 with phasing out of livestock grazing by voluntary retirement of permits from willing sellers	1. Same as #1 2. Same as #1 3. Same as #1. 4. Same as #2. 5. Increased to adjudicated capacities with herding required.
Wildlife 1. Raptor perches	Remove all abandoned power poles and install anti-perching devices on active power lines.	Nest platforms and perches on some abandoned power poles, some artificial nesting platforms, active power poles available for raptor perches	Same as #1.	Only remove abandoned power poles.
Surface water	Return a portion of the Birch Cr. winter return flows to one location, if available.	B.C. Hydro winter returns into gravel pit	Return a portion of Birch Cr. flows to as many as 3 locations, if available.	Same as #1

Table 1. (continued).

Program	Alternative 1: Proposed Action	Alternative 2: No Action	Alternative 3: Emphasize Resource Protection	Alternative 4: Emphasize Opportunity for Resource Development
Wildfire				
1. Resource Advisors	1. Assigned to all fires	1. None	Same as #1	1. Assigned to all fires.
2. Suppression	2. Prioritized list of suppression tactics including MIST.	2. All suppression tactics available including MIST.		2. Same as #2
3. vegetation burnout within containment lines	3. only as last resort	3. as necessary		3. Same as #2.
4. Fire rehab.	4. Only suppression areas following site specific evaluation	4. Site specific evaluation. Species allowed as under Revegetation section.		4. Same as #1

3. AFFECTED ENVIRONMENT

As shown in Map 1, the Reserve is located on the northwest corner of the INEEL and covers approximately 73,263 acres. This is a cold desert area at an average elevation of approximately 5,200 feet and large daily and season temperature fluctuations. The average annual temperature is 42 degrees and snow cover typically lasts for 2 to 3 months. During summer, low humidity and clear skies result in high evaporative demand during the day and low temperatures at night. Being in the rain shadow of several mountain ranges, the area has an average annual precipitation of only about 8.6 inches. About one third of this precipitation comes during the early growing season with plant available moisture generally used by early July.

Arguably the most significant resources on the Reserve are the pre-European settlement condition plant communities that have developed since the withdrawal of the INEEL lands between 1946 and 1958.[a] Prior to that time, severe drought and unlimited livestock grazing had led to plant communities dominated by shrubs with very little perennial herbaceous understory (Anderson and Inoyue, 2001). With limited human access, the plant communities have improved to the Relic (State II) conditions as described by West (2000). Approximately 50% of the Reserve has had very little livestock grazing during that time.

The regional climate predisposes the area to recurring fire and fire has played an important role in the evolution of many cold desert plants. Historic fire occurrence intervals ranged from 20 to 100 years (Wright and Bailey, 1982). The majority of native plant species survive these infrequent wildfires, especially fires occurring in late summer or fall when plants are dormant. Notable exceptions are the several varieties of big sagebrush which must re-colonize burned areas by seed dispersal. The introduction and spread of cheatgrass has disrupted historic fire regimes in many parts of the Intermountain West and increasingly threatens the Reserve.

3.1 INEEL Facilities

TAN is located less than 1/2 mile from the Reserve boundary and is composed of two active operations areas: the Contained Test Facility and the Technical Support Facility; and two inactive areas: the Initial Engine Test Facility and WRRTF. WRRTF is the only facility within the Reserve boundary, is out-of-service and is slated for demolition. All of the TAN facilities are surrounded by a defensible space capable of protecting them from wildfire.

3.2 Lands and Minerals

The Reserve covers portions of each of the four withdrawals that created the INEEL. Beginning in 1946 Public Land Orders withdrew public lands for the use of the Departments that eventually became DOE-ID. Each withdrawal allows for specific land uses and eliminates other traditional forms of multiple-use. Potential land uses on the Reserve are limited to livestock grazing, ROWs and mineral material extraction. By Memoranda of Understanding, the BLM administers these programs with DOE-ID approval.

One Utah Power and Light 230 KV power line and two INEEL 138 KV lines cross the Reserve. The Reserve portion of the Utah Power and Light line is approximately 12 miles long with 81 support structures. The INEEL East Loop is approximately 9 miles long and the West Loop is 10.5 miles long.

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a. Public Land Orders 318, 545, 637, and 1770.

These INEEL lines have a total of about 150 support structures. State Highways 22, 28 and 33 are on portions of the Reserve with several buried optical phone lines within the highway ROWs.

Portions of the Reserve contain extensive deposits of mineral materials (sand, gravel or clay). While these have been mined in the past for highway construction and DOE-ID uses, there are currently no active quarry sites. The old quarry sites have all been abandoned and reclaimed. One 200 acre silt/clay site has been permitted near WRRTF. Only the area withdrawn by Public Land Order 1770 is available for mineral material development. This withdrawal covers about 30% of the Reserve and is generally located north of Highway 22.

3.3 Roads

The Reserve contains a variety of highways and roads ranging from paved State Highways to lightly used two-track trails. State highways are constructed and maintained to standards established by the Idaho Department of Transportation. They are paved, receive high volumes of high-speed traffic, and are engineered to specific standards. Paved State Highways crossing the Reserve include Highways 22, 28 and 33. These have a total length of 23 miles on the Reserve and cover approximately 91 acres. Lincoln Road is a paved INEEL access highway also crossing the Reserve.

For both public safety and INEEL security, public use of INEEL roads off of the State Highways is not allowed without specific DOE-ID authorization. Public access is allowed on establish roads only in specified portions of the Reserve for big game hunting.

The Reserve contains approximately 259 miles of interior INEEL roads and trails some of which are graveled, but most being two-track dirt trails. Many of these tracks date from the 1940's or earlier and have been kept in existence through use, both official and unofficial. Other trails shown on maps may no longer exist due to discontinued use and natural revegetation.

Major roads have been assigned specific "T" numbers, of which T-9, T-17, T-23, T-27 and T-28 are on the Reserve and T-20 serves as the southwestern boundary. See Alternatives 1 and 3 Roads maps. Many roads have assigned classifications which determine maintenance priority: For example, Priority 1 emergency evacuation roads are kept graded for rapid 4WD passage; Priority 2 powerline roads and Priority 3 wildfire access roads are graded as necessary; and Priority 4 primitive roads are not maintained. Permitted road uses include fire suppression, livestock herder access, stock-water hauling, research, site security, big game hunting and other INEEL specific needs. Duplication in access and use exists between many of the Priority 4 roads.

3.4 Noxious and Invasive Plants

Idaho Noxious weeds identified on the Reserve include black henbane (*Hyoscyamus niger*), musk thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), Dalmation toadflax (*Linaria genistifolia*), spotted knapweed (*Centaurea maculosa*), Russian knapweed (*C. repens*), leafy spurge (*Euphorbia esula*) and Rush skeletonweed (*Chondrilla juncea*). Much of the Reserve has not been inventoried for weed infestations, but known locations of some of these species are shown on Map 5. Other significant invasive species, not on the noxious weed list include cheatgrass, halogeton (*Halogeton glomeratus*), Russian thistle (*Salsola kali* ssp. *tragus*), and tumble mustard (*Sisymbrium altissimum*). Currently none of these occupy large acreages on the Reserve, but their expansion is likely due to their aggressive nature. In a literature survey, Pyke (1999) identified 46 exotic species that are weeds capable of invading sagebrush steppe ecosystems, with as many as 20 of these classed as highly invasive and competitive.

While cheatgrass is not common on the Reserve, it is scattered along roads and in areas of livestock concentration such as along the dry Birch Creek channel. The potential for this invasive annual to increase on the Reserve and concurrently increase fire frequency, is a significant threat to the integrity of the native plant communities. Research has shown that this species typically increases in areas of soil disturbance throughout the region (Pellant, 1996). The State highways crossing the Reserve, the network of INEEL access roads, livestock grazing, and movement of wildlife species all provide significant vectors for expansion of these undesirable plants.

Crested wheatgrass is well established on the Reserve along Lincoln Boulevard, the State Highways and surrounding WRRTF where it was seeded in the past for reclamation. In all of these areas, the crested wheatgrass is spreading into adjacent native plant communities. Many researchers have found this to be common within the region (Box, 1986; Pyke, 1996; Elliot and White, 1987; Powell et al., 1994; Walker et al., 1995).

3.5 Native Plants

While no extensive vegetation inventory specific to the Reserve has been conducted, an INEEL wide survey identified approximately 400 species of vascular plants (Anderson et al., 1996). Natural vegetation typically consists of a shrub overstory with a perennial forb and grass understory. The most common shrubs are Wyoming big sagebrush (*Artemisia tridentata* ssp. w*yomingensis*), basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), and green rabbitbrush (*Chrysothamnus viscidiflorus*). The understory is generally dominated by thick-spiked wheatgrass (*Elymus lanceolatus*), bottlebrush squirreltail (*Elymus elymoides*), Indian ricegrass (*Oryzopsis hymenoides*), needle-and-thread grass (*Stipa comata*), Sandbergs bluegrass (*Poa secunda*) and bluebunch wheatgrass (*Pseudoroegnaria spicata*). Eighty-five percent of the vascular plant species are native, and three–fourths of those are forbs (Anderson, 1999).

The character of plant communities on sagebrush steppe is defined by continuous competition for limited water. There is a shared dominance between shrubs and herbaceous understory vegetation. Shallow, fibrous-rooted herbaceous plants are favored in wetter years, thriving on spring rains, while deeply rooted shrubs have the competitive advantage during droughts and survive by tapping deeply infiltrated moisture (West, 2000). In North America, these communities are widely distributed in the Great Basin, and upper Columbia, Missouri, and Colorado River Basins. The southern limits of the sagebrush steppe are the semi-deserts of the Southwest (West, 2000) with the wettest communities extending into the open Douglas fir, Ponderosa pine and juniper communities of the Sierras, Cascades and Rocky Mountains.

3.5.1 Major Native Plant Communities

Vegetation community classifications for the Reserve have been compiled primarily from three sources that describe distinct community types encompassed within the larger, more general sagebrush steppe ecosystem on the INEEL. The references used to describe the following community types include *Plant Communities, Ethnoecology, and Flora of the Idaho National Engineering Laboratory* (Anderson et al., 1996), *Vegetation Types and Surface Soils of the Idaho National Engineering Laboratory Site* (McBride et al., 1978), and *Vegetation Studies to Support the NPR Environmental Impact Statement* (Anderson, 1991). Polygons from the McBride et al. (1978) map were used to delineate major vegetation types, however community classifications follow the more recent classifications described by Anderson et al. (1996). A single vegetation class was assigned to many of the polygons; however, a combination of two vegetation classes was assigned to some polygons where two vegetation types form heterogeneous patches within the polygon. Note that two vegetation types, Sagebrush/Saltbush and Sand Dunes, that were not described as distinct classes in Anderson et al. (1996) have been added.

Vegetation data were collected on the Reserve in late summer and fall of 2002. These data, in conjunction with data from the sources listed above and data from BLM monitoring plots were used to assign vegetation classes to each polygon as shown on Map 6. The 2002 vegetation data were also used to tailor the Anderson et al. (1996) vegetation class community descriptions to the plant communities on the Reserve, and to provide more detailed descriptions of polygons labeled as complexes. Species nomenclature follows the National PLANTS Database (USDA, NRCS, 2002).

Juniper Woodlands: These communities generally have an overstory of Utah juniper (*Juniperus osteosperma*) which may be co-dominant with Wyoming big sagebrush or black sagebrush (*Artemisia nova*). Occasionally neither sagebrush species is present, with the understory being dominated by native grasses and forbs.

Additional shrub species commonly found include green rabbitbrush, shrubby buckwheat (*Eriogonum microthecum*), and prickly phlox (*Leptodactylon pungens*). Typical understory grasses include Indian ricegrass, needle-and-thread grass, and bluebunch wheatgrass. Indian ricegrass and needle-and-thread grass tend to be common in lower elevation juniper communities with bluebunch wheatgrass becoming more prevalent with increasing elevation. Forbs common to this community class include arrowleaf balsamroot (*Balsamorhiza sagittata*), tapertip hawksbeard (*Crepis acuminata*), Hood's phlox (*Phlox hoodii*), and ballhead gilia (*Ipomopsis congesta*).

Grasslands: The composition of these communities is highly variable, but all are dominated by perennial grasses. These may be rhizomatous species, bunchgrasses, or a combination of both. Thick-spiked wheatgrass, western wheatgrass (*Pascopyrum smithii*), creeping wildrye (*Leymus triticoides*), and Douglas' sedge (*Carex douglasii*) are common dominant rhizomatous species. Dominant bunchgrass species include Great Basin wildrye (*Leymus cinerus*), Indian ricegrass, bottlebrush squirreltail, needle-and-thread grass, Sandberg bluegrass (*Poa secunda*), and bluebunch wheatgrass. Most commonly, grasslands on the Reserve are dominated by needle-and-thread grass and/or Indian ricegrass, with thick-spiked wheatgrass occurring very frequently. Grasslands may also include crested wheatgrass (*Agropyron cristatum*) seedings.

Shrubs often occur within grassland communities, but shrub cover is generally sparse. Shrub species frequently include black sagebrush, Wyoming big sagebrush, basin big sagebrush, green rabbitbrush, and prickly phlox. Gray horsebrush (*Tetradymia canescens*) and shrubby buckwheat may also occur sporadically. Pricklypear (*Opuntia polyacantha*) is often locally abundant. Forbs typically occuring in Reserve grasslands include whitestem globemallow (S*phaeralcea munroana*), whitestem blazingstar (*Mentzelia albicaulis*), western tansymustard (*Descurainia pinnata*), and western stickseed (*Lappula occidentalis*). A number of alien species may also be common within this vegetation type.

Sagebrush Steppe: Sagebrush steppe communities on the Reserve are generally dominated by Wyoming big sagebrush, but Basin big sagebrush may dominate or the two species may co-dominate. Basin big sagebrush patches generally are surrounded by extensive stands of Wyoming big sagebrush. The distribution and abundance of these two subspecies is related to soil depth and texture. Basin big sagebrush tends to dominate on deep, well drained, sandy soils, such as those found on the lee side of lava ridges where sand accumulates, and in and around stream channels. Conversely, Wyoming big sagebrush tends to dominate on fine-textured, shallower soils. Typically, native perennial grasses are more abundant under Wyoming big sagebrush than under basin big sagebrush. Aside from differences in grass abundance, both sagebrush species have similar understory species compositions with species variability under basin big sagebrush being higher.

Common understory grasses in sagebrush steppe communities include thick-spiked wheatgrass, Indian ricegrass, needle-and-thread grass, and Sandberg bluegrass. Green rabbitbrush, winterfat

(*Krascheninnikovia lanata*), prickly phlox, and spiny hopsage (*Grayia spinosa*) are frequently occurring shrubs. Green rabbitbrush, winterfat and prickleypear can be locally quite abundant. Shadscale (*Atriplex confertifolia*) may also occur occasionally in low densities. Common forbs include fernleaf biscuitroot (*Lomatium dissectum*), threadstock milkvetch (*Astragalus filipes*), Hood's phlox, and hoary aster (*Machaeranthera canescens*).

Winterfat/Sagebrush. These communities are either dominated by winterfat, or co-dominated by winterfat and Wyoming big sagebrush. Green rabbitbrush occurs frequently and gray horsebrush occurs sporadically, but may become locally abundant. Spiny hopsage may also occur sporadically. Perennial grasses are frequently abundant in winterfat/sagebrush communities, especially Indian ricegrass. Additional common grasses include thick-spiked wheatgrass and bottlebrush squirreltail. Within this community, Hood's phlox and hoary aster are some of the most frequently occurring forbs.

Salt Desert Shrub: Three distinct salt desert shrub community types are found within the Reserve. All three occur on playas within the Lake Terreton drainage, are characterized by a high percentage of bare ground and contain winterfat and other members of the chenopod family. Plant species compositions of these three community types can vary considerably.

The first salt desert shrub community type is dominated by Nuttall's saltbush (*Atriplex nuttallii*). Shrubby buckwheat and winterfat are common and either species may be co-dominant. Indian ricegrass and bottlebrush squirreltail often occur, and Wyoming big sagebrush and thick-spiked wheatgrass may be locally abundant, but not dominant.

The second type of salt desert shrub community is dominated by shadscale. Winterfat, green rabbitbrush and Indian ricegrass may be abundant with Nuttall's saltbush occurring occasionally. Spiny horsebrush, greasewood (*Sarcobatus vermiculatus*), and western wheatgrass also occur sporadically.

The third community type is co-dominated by fourwing saltbush (*Atriplex canescens*) and winterfat. This vegetation type covers a relatively minor area with low perennial grass and forb cover being characteristic.

Sagebrush/Saltbush: This vegetation class represents communities in which sagebrush species dominate and salt desert shrub species are common. This community is differentiated from sagebrush steppe communities by a higher content of salt desert shrub species. Wyoming big sagebrush is always a dominant species, and black sagebrush or low sagebrush (*Artemisia arbuscula*) may be co-dominant and are generally present. Shadscale is typically the most common salt desert shrub species and winterfat may also be abundant. Additional commonly occurring shrubs include green rabbitbrush and fourwing saltbush. Indian ricegrass is nearly always present with needle-and-thread grass and bottlebrush squirreltail being locally abundant.

Low Sagebrush: Low sagebrush vegetation types are characterized by the dominance of low sagebrush, black sagebrush or a combination of both, but low sagebrush is usually the dominant. Although both species occur on shallow soils, black sagebrush tends to become a dominant only on lava ridges. Wyoming big sagebrush, shadscale, and green rabbitbrush commonly occur and may be locally abundant. Additional shrubs include winterfat, broom snakeweed (*Gutierrezia sarothrae*), and prickly phlox.

Most low sagebrush communities have an abundance of native perennial bunchgrasses and forbs. Bottlebrush squirreltail and Indian ricegrass are typically quite abundant with needle-and-thread grass, bluebunch wheatgrass, and Sandberg bluegrass common. Indian ricegrass and needle-and-thread grass occur frequently at lower elevations with bluebunch wheatgrass becoming prevalent with increasing

elevation. Pricklypear distribution is widespread and common forbs include Hood's phlox, northwest Indian paintbrush (*Castilleja angustifolia*), and shaggy fleabane (*Erigeron pumilus*).

Rabbitbrush/Sagebrush: Dominated by green rabbitbrush or co-dominated by green rabbitbrush and Wyoming big sagebrush, these communities can have a rich understory of perennial grasses and forbs. Winterfat occurs frequently and gray horsebrush may be locally abundant. Common grasses in this community type include needle-and-thread grass, thick-spiked wheatgrass, and bottlebrush squirreltail. Great Basin wildrye may be locally abundant, and Indian ricegrass occurs regularly, but usually in low densities. Forbs frequently included are Hood's phlox, ballhead gilia, Wilcox's woollystar (*Eriastrum wilcoxii*), Torrey's milkvetch (*Astragalus calycosus*), hoary aster, and Douglas' dustymaiden (*Chaenactis douglasii*).

Sand Dunes: These areas have sparse vegetative cover with unstable substrate. Most plant cover comprises annual species such as Russian thistle (*Salsola kali*) and tall tumble mustard (*Sisymbrium altissimum*). Indian ricegrass also occurs intermittently at low densities.

Sagebrush Steppe—Sagebrush/Saltbush Complex: A complex of the sagebrush steppe and sagebrush/saltbush vegetation classes occur associated with the channels of the Birch Creek drainage. Sagebrush steppe communities within this complex are primarily dominated Basin big sagebrush and are found on deep soils. The sagebrush/saltbush communities within this complex are dominated by Wyoming big sagebrush and have an abundance of shadscale with low sagebrush often present.

Sagebrush/Saltbush—Low Sagebrush Complex: This landscape is found on a basalt lava flow that has had subsequent loess accumulation and soil formation. The low sagebrush communities are dominated by black sagebrush and occur on, and around exposed basalt outcrops. The sagebrush/saltbush vegetation is found in the lower lying areas and is dominated by Wyoming big sagebrush with abundant shadscale and low sagebrush.

3.5.2 Long-Term Vegetation Changes

In 2001, Jay Anderson and Richard Inouye from Idaho State University analyzed data from permanent vegetation plots established in 1950 on the INEEL (Anderson and Inouye, 2001). Ninety two plots were sampled in 1950, 1957, 1965, 1975, 1985, and 1995. Of these, 47 have not been grazed by livestock since 1950, with the remaining 35 being grazed. Those plots on the Reserve are displayed on Map 6. When the plots were established, the region had been in severe drought for almost 20 years and had a history of heavy livestock grazing dating back to the 1880's. The data from 1950 showed very low cover of perennial grasses, low density and richness of perennial forbs, dominance of plots by sagebrush and other shrubs, and homogeneity of plots. The authors performed numerous cluster analyses and ordination of the data from the 47 core plots.

Their general findings included:

- Although the plots were dominated by shrubs in 1950, large changes in vegetation were measured over the 45 year period, refuting the idea that shrub dominance is irreversible. This reflected the increased capacity of individual species to capitalize on local variation of resources and inherent randomness of plant establishment once growing conditions improved.

- Cover of each of the most common perennial grasses increased many fold between 1950 and 1975. Cover of bottlebrush squirreltail, Indian ricegrass and needle-and-thread grass, then declined after 1975, while that of thickspike wheatgrass and bluegrasses (Poa spp.) remained high until the mid

80's before declining. Total cover of perennial grasses increased from .5% in 1950 to 6.2% by 1975, then varied between 1.4% and 4.0% until 1995.

- Shrubs dominated vegetative cover in all years, but peaked in 1975. Subsequent decreases were attributed to widespread mortality of basin big and Wyoming sagebrush species, the two dominant species. The reasons for the die off were likely due to the multiple stressors of sagebrush webworm, high vole populations, soil conditions and fungal parasites.

- While aggregate species richness for shrubs and perennial grasses changed little over the 45 years, the mean species richness, per plot increased during the period. This was due to expansion of previously isolated populations rather than immigration of new species.

- With the exception of increase in perennial grasses, general increase in species richness, and a continuous increase of green rabbitbrush, there was little evidence of directional change in plant species composition.

- There was no evidence of seral replacement among the perennial grasses. The data did not suggest succession as predicted by classic rangeland models. Apparently viable remnant populations were able to take advantage of the improved conditions after 1950 and there was also very little cheatgrass or other invasive annuals present until 1975.

- The plots became much more heterogeneous through time, rather than converging on some potential or climax. This is as expected as communities recover from the combined effects of grazing and drought. Grazing tends to homogenize vegetation by removing the most palatable species, thereby reducing biodiversity.

- There were no significant correlations between cover and current year precipitation. Analysis indicated that there was possibly a 2 to 4 year lag in the responses of species or functional groups to precipitation patterns. Each species responded individually to environmental variations. The large variations in regional precipitation, both annually and long-term, may be important to the coexistence of shrubs and perennial grasses in this ecosystem.

- Cover data for perennial grasses and shrubs indicate that, at least in some years, competition affected the abundance of some species. There were significant negative correlations between cover of perennial grasses and cover of shrubs in seven of the nine sample years.

- Functional stability of the plant community, total cover, and by inference, total productivity were directly correlated to species richness.

- Invasion of cheatgrass increased dramatically between 1965 and 1975 and the number of plots with this exotic has increased in the years since. Point frame data indicate that the cover of cheatgrass is inhibited by cover of native species.

3.5.3 Rare Plant Species

No plant species listed as Endangered or Threatened under the ESA are known to occur on the Reserve. Table 2 lists those rare plant species known and their status.

Table 2. Rare plants known to occur on the reserve.

Species	National Heritage Program[a]	INPS Rank[a]	IDFG Rank[a]	Federal Rank (USFWS) [a]	BLM Rank[a]	Comments
Lemhi milkvetch *Astragalus aquilonius*	S3	S			S	Generally on unstable, steep banks, sandy washes and gullies within the shrub-steppe zone at lower elevations. (ICDC, 2002).
Winged-seed evening primrose Camissonia pterosperma	S2	S	S		S	Found on dry, open slopes, ridges, and washes in the sagebrush and pinyon-juniper zones associated with *Juniperus osteosperma* and *Artemesia arbuscula*. (Cholewa and Henderson, 1984)
Spreading gilia *Ipomopsis polycladon*	2	2	2		S	Dry, open places in the foothills and valleys, with sagebrush and sometimes Atriplex. (ICDC, 2002).
Earth lichen *Catapyrenium congestum*	S		S			Known on the INEEL, near the Reserve. (Mosley and Pitner, 1996) Uncommon in *Artemesia* and *Atriplex* communities in southern Idaho and Utah

a. Refer to Appendix I for explanations of rankings.

3.6 Livestock Grazing

From early settlement in the 1880's until the passage of the Taylor Grazing Act in 1934, the Snake River Plane was heavily grazed by livestock. Historians document large numbers of horses, sheep and, later, cattle brought in by miners, ranchers, homesteaders and the Army (Oberg, 1970). The extent to which these practices changed the native vegetation on the INEEL is not known, but livestock grazing was conducted on a first come, first served basis with no limits during these times.

The Taylor Grazing Act was enacted in 1934 "to stop injury to the public grazing lands by preventing overgrazing and soil deterioration…. [and]…. to stabilize the livestock industry…." The Act created 50 grazing districts across the west, including the Birch Creek and Howe districts and established the Range Advisory Boards. In the early years, the General Land Office charged $.05 for an AUM. During the adjudication process in the early 1960's, the Birch Creek and Howe grazing districts were divided into the present day allotments.

The Reserve contains portions of four grazing allotments as shown on Map 7. These are managed by the BLM in conjunction with adjacent public lands under a Memorandum of Understanding with DOE-ID. With essentially no perennial water on the Reserve, grazing suitability and capacity are limited. Water must be hauled to stock tanks located on BLM land within each allotment. By DOE-ID policy, approximately 41,071 acres of the Reserve are not within grazing allotments and are grazed infrequently by livestock.

Table 3. Grazing allotment ownership and use.

Allotment	Total Acres	Private and State Acres	BLM Acres	INEEL Acres	Reserve Acres	Total Grazing Preference (AUMs)	Total Active Preference (AUMs)	Active Preference on Reserve (AUMs)
Wigwam Butte	15,287		5,120	10,167	10,167	1,236	967	642
Sinks	20,421	640		19,781	3,870	1,511	1,333	253
Twin Buttes	196,724	6,923	9,382	180,419	3,540	17,430	14,630	263
Mahogany Butte	55,891	3,440	34,935	17,516	14,682	1,806	1,806	471

Cattle Allotments

The Sinks and Wigwam Butte allotments, located along the west side of the Reserve, are grazed by cattle. Generally, there are no allotment boundary fences with livestock distribution being controlled by water placement. The boundary between the Wigwam and Mahogany Butte Allotments is partially fenced, allowing livestock drift onto adjacent allotments or into the un-grazed area.

Sheep Allotments

Sheep are grazed on the Twin Buttes and Mahogany Butte Allotments, which cover the northern end and east side of the reserve. Distribution of the sheep is controlled by herding. Twin Buttes is a common allotment with 15 permitees herding bands of sheep over 196,724 acres. Approximately 2% of the Twin Buttes Allotment is on the Reserve.

Table 4. Grazing allotment permitees and seasons of use.

Allotment	Permitee	Number of Animals	Total Active Preference (AUMs)	Active Preference on Reserve (AUMs)	Season of Use	Stocking rate
Wigwam Butte (BLM file #2032)	Woodie Land and Livestock	323 375 Cattle	592 375	394 248	May 1 to June 25 Jan 1 to Jan 31	16 acres/ AUM
Sinks (BLM file #2020)	Woodie Land and Livestock	Cattle	460 25 221	87 5 42	May 1 to June 25 Jan 1 to Jan 31 May 1 to June 25	14 acres/AUM
	Robert Mays	100 Cattle	473	90	May 1 to Sept. 22	
	Dean Mays	70 Cattle	154	29	May 1 to July 6	
Twin Buttes (BLM file #13000)	Common use allotment with 15 permitees	33,002 Sheep	14,630	263	Generally winter or spring grazing by the various permitees	13 acres/ AUM
Mahogany Butte (2025)	Ball Brothers Sheep Co.	1146 2400 Sheep	543 1263	143 328	April 20 to June 30 Dec 11 to Feb 28	29 acres/ AUM

3.7 Wildlife Habitat

A variety of ephemeral and unique habitats exist on the Reserve that increase the diversity of wildlife species found there. While the vast majority of the area is sagebrush, grassland and salt desert shrub, the juniper woodlands, lava flows, cinder cones, lava tubes, ephemeral playa lakes and remnant riparian habitats create niches for many more species than would otherwise be expected. Five fish, one amphibian, nine reptile, 159 bird and 37 mammal species have been documented on the INEEL (Reynolds et al., 1986). An additional nine fish, five reptile, 13 bird and 14 mammal species are listed as possibly occurring because portions of their range overlap the INEEL area, or they have been reported within 30 km of the site.

Wildlife species of management significance are categorized into four major groups (Sperber et al., 1998):

A. Endangered and Threatened Species

B. Species of special concern (State, Federal and Tribal)

C. Big Game species

D. Sagebrush Obligate species.

3.7.1 Endangered and Threatened Wildlife Species

This category includes species that the FWS has classified as endangered or threatened under the ESA. The ESA provides Federal protection for certain species of plants and animals and their critical habitats, and authorizes the Secretary of the Interior to develop and implement recovery plans for each listed species. Bald eagles are listed as Threatened and have been documented on the Reserve. Their use is primarily during the winter months. The Gray wolves in the region are listed as an Experimental/non-essential population. They have not been documented on the Reserve, but could reach the area by dispersing from established packs to the north and east.

3.7.2 Species of Special Concern

The FWS also provides a listing of plants and animals that are **species of concern** due to population status and/or threats to their long-term viability. **Culturally significant species** were added by the Shoshone-Bannock Tribes. All of these species have no legal status under the ESA, but are considered by agencies and the tribes during project planning and review.

Wildlife Species of Concern Potentially Occurring on the Reserve

Mammals

Species of Concern	**Culturally Significant Species**
pygmy rabbit (*Brachylagus idahoensis*)	coyote (*Canus latrans*)
small-footed myotis (*Myotis ciliolabrum*)	badger (*Taxidea taxus*)
long-eared myotis (*Myotis evotis*)	yellowbelly marmot (*Marmota flaviventris*)
Townsend's big-eared bat (*Plecotus townsendii*)	blacktail jackrabbit (*Lepus californicus*)
Merriam's shrew (*Brachylagus idahoensis*)	Whitetail Jackrabbit (*Lepus townsendi*)

pronghorn (*Antilocapra Americana*)
elk (*Cervus canadensis*)
mule deer (*Odocoileus hemionus*)
Whitetail deer (*Odocoileus virginianus*)
muskrat (*Ondatra zibethica*)

Birds

Species of Concern
sage grouse (*Centrocercus urophasianus*)
ferruginous hawk (*Buteo regalis*)
long-billed curlew (*Numenius americanus*)

Culturally Significant Species
bald eagle (*Haliaeetus leucocephalus*)
golden eagle (*Aquila chrysaetos*)
red tailed hawk (*Buteo jamaicensis*)
burrowing owl (*Speotyto cunicularia*)
woodpeckers (*Picoides and Colaptes spp.*)
great horned owl (*Bubo virginianus*)
all migratory waterfowl

Amphibians and Reptiles

Species of Concern
western toad (*Bufo boreas*)
northern leopard frog (*Rana pipiens*)
ringneck snake (*Diadophis punctatus*)
western terrestrial garter snake (*Thamnophis elegans*)
short-horned lizard (*Phrynosoma douglassi*)

Culturally Significant Species
western rattlesnake (*Crotalus viridis*)

3.7.3 Big Game Species

Big game species have high recreational interest from a hunting and wildlife viewing standpoint. Species in this category found on the Reserve include pronghorn antelope, elk, and mule deer.

Pronghorn antelope: The Reserve is pronghorn transition range in all years and provides winter range to a large percentage of the regional herds in mild winters. The animals migrate to winter range from the Birch Creek Valley where they spend the summer months. During periods of high herd numbers, some pronghorn may summer on the Reserve. Of particular concern to biologists is a declining fawn:doe ratio observed in recent years due to unknown causes.

Elk: Elk wintering on the INEEL has been documented since the mid 1980's (Moritz 1988 as cited in Strohmeyer, D.C. and J.M. Peek 1996). Herds migrated from the Valleys of the Little Lost, Birch Creek, Crooked Creek, Medicine Lodge, and Sand Creek. Wintering populations ranged from 150 in 1989 to 650 in 2000 (unpublished report, May 17, 2000, Environmental Science & Research Foundation, Inc.). Depredations on adjacent farmlands began to develop in the late 1980s as growing numbers of elk remained on the INEEL year-round. Summer populations ranged from 50 elk in 1995 to 142 in 1999, depending upon water availability (Unpublished report, September 7, 1999 Environmental Science & Research Foundation, Inc.). Once water on the site was gone, elk moved to adjacent farmlands where irrigation systems offered not only water, but also green vegetation throughout the dry summer months. Special depredation hunts, hazing and trapping have been tried, but have met with only short-term success and have often created public controversy.

Mule deer: Approximately 150 to 200 mule deer frequently winter in the unnamed drainage on the southwest end of the Lemhi Range. Bitterbrush and mountain mahogany stands in this area are especially important to the wintering animals. Smaller numbers also winter on the Birch Creek side of the Lemhi Range. Most deer that winter on the Reserve spend the summers to the north and west. The maintenance of high quality winter range for Mule Deer is vital to securing an abundant mule deer population.

3.7.4 Sagebrush Obligate Species

Sagebrush obligate species require sagebrush for some portion of the year for survival. With continued regional decline in sagebrush steppe habitats, populations of these species are declining. The prospect of significant additional Threatened or Endangered species listings has prompted Federal and state agencies to develop conservation strategies and working groups to aid in protecting and restoring western rangelands. The Upper Snake Sage Grouse Local Working Group is an example of groups attempting to conserve these species before they are listed.

Species in this category potentially found on the Reserve include the following:

Birds

sage thrasher (*Oreoscoptes montanus*)
sage sparrow (*Amphispiza belli)*
sage grouse (*Centrocercus urophasianus)*
Brewer's sparrow (*Spizella breweri)*

Mammals

pronghorn antelope (*Antilocapra Americana)*
pygmy rabbit (*Brachylagus idahoensis)*
sagebrush vole (*Lagurus curtatus)*

Reptiles

northern sagebrush lizard (*Sceloporus graciosus*)

Sage Grouse

Sage grouse have received the most attention of the sagebrush obligate species and have established management guidelines (Appendix 2). Large amounts of scientific research have been conducted and recent petitions for listing have highlighted their plight. Sage grouse populations have exhibited long-term declines throughout North America Data from breeding areas (leks) compiled by the Upper Snake/Salmon Local Working Group show an average of 40–50% decline from long-term averages (IDF&G unpublished data). The sage grouse on the INEEL are a migratory population. They typically move large distances during seasonal migrations, as much as 52 miles over the course of a year (Connelly and Ball, 1982). Most grouse from the Reserve move up the Birch Creek Valley during the summer.

The entire Reserve has been identified as key sage grouse habitat due to the intact sagebrush steppe habitat found there. Sage grouse are considered an umbrella species and the assumption is made that habitat needs for other sagebrush obligate species are being benefited as a result of protection, improvement and restoration of sage grouse habitat (Sather-Blair et al., 2000).

Sage Grouse Breeding Habitat

With four known leks in the northern part of the reserve, the birds have been shown to move as much as 18 km (11 miles) from leks to nest sites, making all suitable habitat within 18 km of the leks

potential nesting habitat. Approximately 64,883 acres, or 89% of the Reserve, are within this distance, but portions of the Reserve do not meet the requirements for suitable nesting habitat as defined in the current sage grouse management guidelines (Connelly et al., 2000) contained in Appendix 2. Radio relocations of nesting hens in 2000 and 2001 indicated successful incubation on two nests in the northern part of the reserve in each of those years. Sagebrush and herbaceous cover provide food and concealment from predators.

Sage Grouse Late Brood-rearing Habitat

From late June to early November sage grouse use a variety of moist and mesic habitats where succulent forbs are found. These include riparian areas, wet meadows, lake-beds, farmlands, some sagebrush habitats and recently burned areas.

Sage Grouse Winter Habitat

During the winter, sage grouse feed almost exclusively on sagebrush. Topographic relief and diversity of sagebrush heights are important. Sage grouse use has been recorded on the northern third of the Reserve during the winter. Due to the migratory nature of this population, it is likely that these individuals move onto the Reserve from elsewhere. Sage grouse select winter use sites based on snow depth, and topography and snowfall can affect the amount and height of sagebrush available to grouse (Connelly, 1982).

3.8 Wildfire

With one exception, there is no evidence of significant recent rangeland fires on the Reserve. Large fires have occurred on the INEEL further south, but the Reserve has been spared over the past 50 years. The reasons behind this are speculative, but possibilities include: (1) low occurrence of lightning strikes due to prevailing weather patterns, (2) relatively limited extent of cheatgrass, (3) areas with low fuel loading, especially on the southwest (windward side) of the Reserve, and (4) fuel reduction through livestock grazing. The possibility of future fires on the Reserve is very high.

Coincident with Euro-American settlement and heavy livestock grazing in the late 1800's, cheatgrass became well established throughout the Intermountain Region (Pyke and Novak, 1994). While this invasive winter annual has spread rapidly in areas with high levels of human activity, the INEEL has generally been spared. Elsewhere in the region, the presence of cheatgrass has had a major effect on fire regimes. Cheatgrass begins growth in very early spring, produces seed, and dries out by late May or June. The dried cheatgrass then remains available as a very flammable fine fuel through the heat of the summer fire season. This increases the chance that fire will start and that fires will burn larger areas once started. The resulting increased fire frequencies have the double effect of benefiting cheatgrass and killing native perennial species. Thus a positive feedback loop is created that converts native communities to annual cheatgrass rangelands with permanently increased fire frequencies (Peters and Bunting, 1994). Fire return intervals as low as three to five years have been noted in the Snake River Plain (Young and Evans, 1978; Wright and Bailey, 1982). Minimizing the spread of cheatgrass on the Reserve is crucial to maintaining the sagebrush steppe plant communities. Even though cheatgrass is found on much of the INEEL, its abundance is currently limited to isolated patches in areas where the soil has been repeatedly disturbed and native perennial plants reduced. On the Reserve these conditions are found along the de-watered channel of Birch Creek and other livestock concentration areas, and along roads.

3.9 Water Resources

The Reserve receives surface water from two tributary basins, the Big Lost River and Birch Creek Valley, and groundwater from the Birch Creek Valley aquifer (#62), Little Lost River Valley aquifer (# 64), and the eastern Snake River Plain regional aquifer (# 39).

Birch Creek surface water and ground water flows enter the reserve from the north and sink into the Eastern Snake River Plain aquifer along the northern margins of the reserve. Beginning in the early 1900's the entire flow was diverted for irrigation into the Reno Ditch, approximately 3 miles above the Reserve boundary. Although water was allowed to flow in the original channel during the winter, flows reached the Birch Creek Sinks only during exceptionally high runoff events. Approximately 3500 acre-feet of water accumulated in the Birch Creek playa during 1969 (Koslow, 1984). Since 1986, Birch Creek has been diverted above the Reno Ditch for irrigation and power generation. This has de-watered approximately 15 miles of historic Birch Creek riparian habitat, including approximately 10 miles on the Reserve. The diversion provides Birch Creek Power with 50 to 60 cubic feet per second for its 2,700 KW plant near Reno Point. The power plant produces an average of 14 million KW-Hrs annually with the water outflow being used for irrigation during the summer (BLM Case-file I-19684, Birch Creek Power). From approximately September through April, the outflows of the power plant are discharged back to the INEEL via a ditch where the water flows into the T-28 North Gravel Pit. Sediments in the water are sealing the canal bottom and gradually filling the pit. The decreased capacity of the pit, combined with ice buildup during cold weather, is causing increasing flows to overtop the pit and increasing flooding potential of TAN.

The Birch Creek, Big Lost River and Little Lost River valleys all contain unconsolidated alluvial materials and porous sedimentary rocks up to a few thousand feet thick (Crosthwaite et al., 1970). These materials overlie relatively impermeable volcanic rocks and provide a porous conduit for the valley aquifer systems. While most of the water in each watershed originates in the adjacent mountains, the numerous tributaries and valley bottom streams lose most of their flow via seepage into the ground water before reaching the Reserve, except during heavy runoff events. Heavy surface flows have been recorded onto the Reserve from both Birch Creek and the Big Lost River.

Ground water depths beneath the Reserve vary from about 200 to 600 feet. The depth to ground water at TAN varies from 200 to over 350 feet (Lewis et al., 1996). Past activities at the INEEL have affected the ground water quality at several sites. Before the mid-1980's, waste discharged to unlined ponds and injection wells introduced radionuclides, heavy metals, inorganic salts and organic compounds to the aquifer. With the exception of Test Area North, all of the facilities at the INEEL are down gradient from the Reserve. At Test Area North, detectable levels of radionuclides and volatile organic compounds have been found in monitoring wells. A number of these wells are on the Reserve. Detected compounds include trichloroethylene, tetrachloroethylene, 1,2-dichloroethylene, and the radionuclides tritium, strontium-90, cesium-137, and uranium-234. In addition, the surface and subsurface contaminants Cobalt-60, strontium-90, barium, cadmium, chromium, mercury, silver, benzene, toluene, ethyl-benzene, and xylene are present at Test Area North (Lewis et al., 1996). Extensive cleanup projects are underway to remediate the ground water and none of the contaminants discharge to or come in contact with the land surface or the biotic components of the Reserve.

3.10 Soil Resources

The soils on the Reserve fall into three soil orders: Entisols, Aridsols and Mollisols as defined by soil taxonomy (USDA, 1999; Olson et al., 1995). The least developed soils, those with minimal plant production, fall into the Entisol Order (Suborder names "…ent"). These are generally on the Lake

Terreton sediments where the combination of dry sites, high clay content and unstable sand dunes limit soil development. On other dry, but more stable sites, slight soil surface horizon development moves the classifications into the Aridisol Order (Suborder names "…ids").Organic matter production is minimal in these areas, but soil surfaces are more stable, allowing for increased darkening of the surface horizons. These soils are found on the basalt flows and most of the Birch Creek alluvial deposits. The most productive soils on the Reserve are Mollisols (Suborder names "….olls"). These are found in more moist landscape positions in the Lemhi Mountains and along the Birch Creek channel. Increased soil moisture allows for more plant production and increased organic matter enrichment of the soils. This results in surface soil horizons that are the thickest and darkest on the Reserve.

3.11 Air Resources

The area surrounding the Reserve is classified as a Prevention of Significant Deterioration (PSD)-Class II Area, designated under the Clean Air Act as an area with reasonable or moderately good air quality while still allowing moderate industrial growth. About 12 miles west of the INEEL is Craters of the Moon National Monument and Wilderness Area, classified as a PSD Class I Area. Planned activities on the Reserve must not negatively impact the air quality in this Class I Area.

3.12 Cultural Resources

Cultural resources are sites, structures, landscapes, and objects of some importance to a culture or community for traditional, historic, religious, scientific, or popular reasons. Historic sites are generally at least 50 years old, but there are younger exceptions. Prehistoric sites and artifacts are aboriginal in nature and predate Euro-American contact (about 1800 in Idaho). Paleontological sites and artifacts are fossils that may be contemporary with or predate human occupation. While approximately 4% of the INEEL has been surveyed for cultural materials, more than 1,500 sites have been identified (Ringe, 1993). Based upon this sampling, the INEEL, and by inference the Reserve contains a large number of cultural resources. Public access restrictions have helped to preserve this unique record of human use in this important area.

The unique natural resources of the Reserve have been attractive to human populations for at least 12,000 years. Crumbling basalt foundations and cisterns left by farmers and ranchers, broken pottery shards, and stone tools left by many generations of hunter-gatherers, as well as ongoing visits by their descendants all speak to the wealth of cultural resources found there. Early inhabitants were undoubtedly attracted by the plant and animal resources offered by the Big Lost River, Birch Creek, their associated Sink areas and the shallow waters of Pleistocene Lake Terreton (Anderson et al., 1996). Campsites as old as 7,000 years occur in association with the wetlands, stream corridors, edges of ancient lava flows and around low hills like Richard's and Cinder Buttes (Ringe, 1993).

More than 100 years ago, Euro-American pioneers were also quick to recognize the wealth of resources offered by the area. Several main stage and wagon roads, and old foundations mark the location of at least one turn of the century stage station. Abandoned homesteads are also common along the Sinks and stream channels, some associated with families that rose to local prominence such as the Renos and Bartels. Early miners, ranchers and homesteaders brought in large numbers of horses, sheep and cattle to grazing on open range.

3.13 Native American Tribal Values

Prior to the arrival of Europeans, the region was populated by the Shoshone and Bannock Tribes (Tribes). These now compose one Federally recognized tribe that includes two distinct groups: the Northern or Snake River Shoshone and the Bannocks. The four Northern Shoshone Band divisions include the Western Shoshone (Warraeekas), the Mountain Lemhi Shoshone (Tukueukas and the Agidikas), the Northwestern Shoshone, and the Fort Hall Shoshone (Pohogue) (Hunn, 1990; Shallat and Burke, 1994).

The Reserve area has been used by the tribes for a wide variety of culturally important uses including hunting, gathering, residential, and as travel routes to both the Camas Prairie and the Salmon River. Many species of plants and animals of significant importance to the Tribes are found there. Tribal members hunt or gather many animal and plant species for subsistence and ceremonial purposes from sagebrush ecosystems. This includes elk, deer, marmots, sagebrush, bitterroot, sweet sage, and biscuit-root. Along with the living environment, the Tribes also value traditional cultural properties such as vistas, landmarks, and areas of high concentrations of culturally significant artifacts. Preservation and protection of these is important for carrying on cultural traditions for future generations and ensuring that members have continued access is vitally important for continuation of Tribal culture. The Tribes are a historic culture that continues to exist.

3.14 Social and Economic Resources

The social and economic implications of public land management are of interest to local residents and to people throughout the United States. Residents of the local Counties are most likely to experience any direct social and economic impacts of the Reserve Management Plan. Due to limited public access to the Reserve, grazing permittee's, right-of-way owners, academic researchers and big game hunters are the most likely to be affected.

The Reserve is within Butte, Clark and Jefferson Counties. The economies and cultures of each of these are traditional western agriculture and ranching. Local economic benefit derived from the Reserve is almost totally livestock grazing with a minor component of income obtained from big game hunting. In addition, a few INEEL employees reside in each of the local communities.

Table 5. Population, employment and demographics.

	Butte Co.	Clark Co.	Jefferson Co.	Idaho	USA
Total Population	2,899	1,022	19,155	1,293,953	281,421,906
Persons/square mile	1.3	0.6	17.5	15.6	79.6
Ag/Forestry/Fishing/ Mining Employment	17.5%	34.4%	12.1%	5.8%	1.9%
Change in non-farm employment (1990–2000)	+85.3%	+230%	+54.9%	+44.7%	+18.4%
White	94.7%	74.2%	90.0%	91%	75.1%
Black	0.3%	0.1%	0.3%	0.4%	12.3%
American Indian	0.7%	1.0%	0.5%	1.4%	0.9%
Asian	0.2%	0.2%	0.2%	0.9%	3.6%
"Other" race	2.4%	23.5%	6.8%	4.2%	5.5%
Hispanic or Latino (of any race)	4.1%	34.2%	10%	7.9%	12.5%
65 and over	14.9%	9.2%	9.3%	11.3%	12.4%
Persons below poverty level	18.2%	19.9%		11.8%	12.4%
Families below poverty level	14.7%	18.7%		8.3%	
(U.S. Census Bureau, 2002)					

3.14.1 Economic Effects of Livestock Grazing

All of the cattle on the Reserve are from ranches in Butte County and the sheep herds come from Clark, Jefferson and Bingham Counties.

Table 6. Reserve use by local livestock industry.

County	Total Beef and Dairy Cattle and Calves[a]	Total Sheep and Lambs[a]	Approximate Numbers Grazing on Reserve
Butte Co.	20,000	9,000	545 cattle
Clark Co.	14,000	6,500	468 sheep
Jefferson Co.	66,000	15,500	2500 sheep
Bingham Co.	80,500	13,500	79 sheep
a. (IASS, 2002)			

While the total numbers of cattle and sheep on the Reserve is small relative to the County totals, many researchers have shown that impacts to local economies are greater than the direct economic values derived from grazing on Federal allotments (Van Tassell and Richardson, 1998 and others). Taylor (2002) attached an economic output per AUM of $60.56 for cattle and $39.67 for sheep grazing on Federal leases in Uinta County Wyoming. This includes direct profits by producers and multipliers for their expenditures within the economy. In addition, each cattle AUM resulted in 0.000774 local jobs and each sheep AUM supported 0.000938 jobs. Using these numbers, the grazing on the Reserve provides the following values to local economies.

Table 7. Economic value of livestock grazing on reserve.

	Wigwam Butte (Cattle)	Sinks (Cattle)	Twin Buttes (Sheep)	Mahogany Butte (Sheep)	Totals
Active AUM's	642	253	263	471	1629
Annual Federal receipts	$808.92	$318.78	$331.38	$593.46	$2,052.54
Value added to economy	$38,879	$15,321	$10,433	$18,684	$83,317
Jobs created	0.50	0.20	0.25	0.44	1.39

3.14.2 Economic Effects of Federal Leases

Federal leases for grazing and utility ROWs on the Reserve generate annual income for the Federal Treasury. Leases for the Reserve portions of the four Federal allotments are shown in Table 7. The Reserve portion of the 230 KV Utah Power and Light power line and the two buried fiber-optic lines rent for a total of approximately $3,718.68 (BLM files). The INEEL power lines and the State highways pay no rental fees on Federal land.

3.14.3 Economic Effects of Big Game Hunting

The portions of the Reserve open to public hunting provide an unknown number of hunter days that are valued at $44.12 each (ASA 1996). Depredation on adjacent farmlands, mostly by elk, is also a significant economic factor. With summer populations on the INEEL ranging from 142 to 500 animals (IDF&G Records), crop losses can be large.

3.15 Environmental Justice

Environmental Justice considers equity and fairness in resource decision-making. Federal law requires that all Federal actions consider potentially disproportionate effects on minority or low-income communities. Potential impacts or changes to low-income or minority community in the project area due to the proposed action must be considered.

Table 5 highlights demographic statistics for the Idaho counties of concern from the 2000 census. Within the counties included by the Reserve, only the Hispanic population in Clark County (34.2%) represents a minority population potentially affected disproportionably by the Reserve Plan. However, the small proportion of Clark County contained within the Reserve and the nature of proposed management actions would have very little effect. Specific actions to address environmental justice concerns were not implemented for this project. No disproportionately negative impacts to low-income or minority community are expected under any alternative.

4. ENVIRONMENTAL CONSEQUENCES

4.1 Analysis Assumptions and Guidelines

1. The Reserve Management Committee would be formed to develop monitoring schemes, analyze data and adjust management in keeping with this management plan, technological advances and research findings.

2. Participating agencies and tribes would be staffed with adequate expertise and resources to participate in a timely and effective manner as cooperators on the Reserve Management Committee.

3. The allocation of funds for implementation of the future management of the Reserve would be adequate to allow the outcomes projected here.

4. Paved roads average 30 feet in width and unpaved roads average 9 feet in width for acreage calculations.

5. Preservation of native plant communities supports the wildlife species dependent upon them.

4.2 Critical Elements

The interdisciplinary team considered all of the following elements of the human environment when analyzing the impacts of the actions proposed under each alternative. The elements checked as "Not Present" or "Present, Not Affected" were either not present on the Reserve or not affected by any of the alternative management actions considered.

Table 8. Critical elements of the human environment.

Element	Not Present	Present not Affected	Present and Affected
Air quality			X
Special Status Species			X
Areas of Critical Environmental Concern	X		
Hazardous Substances or Solid Wastes		X	
Cultural Resources		X	
Water Quality Concerns		X	
Wild Horse Herd Management Areas	X		
Prime or Unique Farmlands	X		
Wetlands/Riparian Zones			X
Floodplains			X
Wild & Scenic Rivers	X		
Native American Religious Concerns		X	
Wilderness Study Areas	X		
Environmental Justice (E.O. 12898)		X	
Noxious Weeds, Invasive Species			X

4.3 Effects of Alternatives on Native Plant Communities

4.3.1 Management Considerations

Nine species of noxious weeds and several other non-noxious invaders are known on the Reserve. While none of these currently infest large acreages they all have potential to spread rapidly and displace native vegetation. Spotted knapweed and Rush skeletonweed, in particular, are threats to spread rapidly.

Of the non-noxious weeds, invasion by cheatgrass, with its accompanying potential for increased fire frequency is a particular threat to the sagebrush communities. This annual grass has become common in isolated patches in areas subjected to repeated disturbance such as along the de-watered channel of Birch Creek, other livestock concentration areas, and along roads. Minimizing cheatgrass spread is critical to avoid the potential for increased fire risk that has plagued many other areas within the Snake River Plain.

The major vectors for weed spread on the Reserve are roads, and their use, livestock grazing, and wildfire and wildfire suppression. In general, minimizing weed invasion requires reducing soil disturbance, maintaining competition from desirable plants and minimizing seed spread vectors. To minimize soil disturbance on the Reserve, roads, road use and off-road travel must be minimized and livestock, wildfire and wildfire suppression properly managed.

Management to conserve biotic and genetic diversity of native plant communities found on the Reserve requires careful selection of plant materials used in restoration projects. Traditional definitions of "native species" consider plants only to the species level. For example "Secar" bluebunch wheatgrass was originally collected from the Palouse Prairie and is genetically different from the bluebunch wheatgrass plants native to the Reserve. Most commercially available cultivars originate from one or more sources and contain the genetic materials specific to those. Use of these cultivars for restoration projects introduces foreign genetics that could 'swamp' the local population via gene flow or displace the local plants through competition (Jones, 1997). Most commercially available cultivars of native species do not originate from the upper Snake River Plain.

Crested wheatgrass species were seeded in revegetation mixtures on the INEEL from the 1940's until the late 1990's. These are cultivars native to Eurasia and were selected for ease of establishment, rapid production of ground cover, competitiveness with weeds and low seed cost. However, most of these characteristics also make them highly competitive with the native plants. Established crested wheatgrass stands along Lincoln Boulevard, the State Highways and surrounding INEEL facilities are spreading into adjacent native plant communities.

Four species of special status plants are know to exist on the Reserve and an additional six species are know on similar habitat within a few miles. None of these are listed as threatened or endangered under the ESA. The BLM is bound by Federal statutes, regulation, and agency policy to conserve special status plant species and biological diversity on public lands. In general, management for retaining plant communities in high quality condition will also provide for the rare species, but some rare species are so localized that populations can be eradicated by a single action such as gravel pit development, road construction, or a fire containment line.

Wildfire and fire suppression both can have wide spread effects on plant communities. While fire has the detrimental affect of killing sagebrush, soil disturbing fire suppression can also have many negative impacts. Recent research on the INEEL (Blew et al., 2002) found that the frequency of cheatgrass on fire containment lines was significantly higher than on adjacent undisturbed burned areas, when the burned areas were in good ecological condition prior to the fire. Therefore, minimizing surface

disturbing fire suppression tactics may be as important as minimizing fire size. Selection of fire suppression tactics is often a trade-off between minimizing fire size and minimizing soil disturbance. Minimum Impact Suppression Tactic (MIST) emphasizes suppression of wildfire using methods that minimize negative effects on surface resources. Tactics are selected which take advantage of natural fuel breaks, minimize new soil disturbance, and minimize damage to high value resources. Specific fire conditions, including potential for spread, current and potential fire-weather, and potential for damage to resources are considered. Application of these tactics may result in larger fires, but less soil disturbance and cheatgrass spread.

Assignment of Resource Advisors to fire suppression teams increases the knowledge base of ecological and cultural resources of the team. With fire personnel focusing on fire suppression, sensitive ecological and cultural resources can easily be overlooked and destroyed. People trained in these resources when assigned as Resource Advisors work directly with Incident Commanders to advise them about resource locations. While there are situations where maximum suppression effort and negative impacts to resources are necessary to protect life and property, minor adjustments in fire suppression actions can often significantly reduce destruction to valuable resources while still stopping the fire.

Vegetation recovery following wildfire depends largely on the condition of the plant community before the fire. Research has shown that areas with in good ecological condition, return to native grasses and forbs within two to three years following fire (Patrick and Anderson, 1999; Ratzlaff and Anderson, 1995). Efforts to revegetate by seeding can actually slow the recovery process of such areas. Ratzlaff and Anderson (1995) and Blew and Jones (1998) and Blew (1999 and 2000) reported that the soil disturbance caused by drilling seed into a recently burned areas slowed recovery of native species and may have led to increased weed infestation.

Natural reestablishment of sagebrush is very slow following fire, especially on dry Wyoming big sagebrush sites. Research has shown that 85-90% of sagebrush seed falls within 1 meter of the producing plant, with a maximum dispersal distance being 30 meters (Wagstaff and Welch, 1990; Young and Evans, 1989). In addition, recent reports suggest that Wyoming big sagebrush requires wet years for significant seed production and seedling establishment (Maier et al., 2001). With these factors, a fire return interval of more than 50 years is required for sagebrush to regain dominance on burned areas. Because of these constraints, retention of isolated unburned patches of sagebrush within burned areas is critical.

Returning all or a portion of the diverted Birch Creek water to the Reserve could allow development of riparian zone along the creek channel. While creating riparian habitat would benefit many wildlife species on the Reserve, the flows in the ditch are transporting spotted knapweed seeds originating from Birch Creek above the diversion point.

4.3.2 Effects of Alternative 1 (The Proposed Action)

Lands and Minerals: Eliminating new mineral material development sites would remove all potential for destruction of native plant communities and weed invasion due to these causes.

Roads: Limiting access to only authorized research vehicles on 154 miles (59%) of unpaved roads would reduce soil disturbance due to road use and maintenance. Weed spread would be reduced by proportional amounts. This alternative would limit use of more miles of road than Alternatives 2 or 4, but less than Alternative 3.

Noxious and Invasive Plants: Establishment of an IWM program would increase effectiveness of weed control and reduce total acres of noxious and invasive plants relative to Alternative 2. Vehicle washing under this and Alternative 3 would reduce, but not totally eliminate, importation of weed seeds to

the Reserve from vehicles. Evaluation and restoration of some crested wheatgrass stands under this and Alternative 3 would reduce threats of this exotic species to expanding into adjacent native plant communities. Returning winter flows to the lower Birch Creek channel would introduce spotted knapweed seeds to any newly created riparian area, requiring additional weed control.

Revegetation: The costs of revegetation seed mixtures would increase and the pace of recovery would be slower on seeded sites. Requiring use of only local plants for revegetation would minimize introduction of non-endemic genetics and possibility of unnatural long-term changes to the native plant communities, including any newly created riparian zones. In rare cases, non-indigenous species may be used, but this would affect only small acreages.

Livestock: Extension of the boundary fence between Wigwam Butte and Mahogany Butte allotments by 12.4 miles would reduce the potential for weed spread by livestock in lower Birch Creek. The integrity of the non-grazed area would also be improved. However, keeping the cattle on the Wigwam Butte Allotment may increase utilization levels on the allotment by increasing livestock concentration there. Requiring certified weed-free hay would eliminate importation of weeds contained in imported feed. Restoration of some livestock concentration areas would reduce the threat of weed invasion by an amount proportional to the acres restored.

Wildlife habitat: Actions proposed for wildlife habitat under this alternative would have no effect on plant communities.

Surface water: Returning winter flows to lower Birch Creek would increase storage of plant available water and riparian re-development relative to Alternative 2. Additional weed invasion along the channel would increase the need for weed control in the short-term. Over time, the seeds contained in the water would be reduced due to cooperative weed control efforts along Birch Creek at the source of the seed on BLM lands.

Wildfire: Formation of the Reserve Management Committee and use of Resource Advisors would improve monitoring and mitigation of fire and fire suppression impacts under Alternatives1 and 3. This would also ensure a higher level of awareness of Reserve resources than under Alternatives 2. Application of prioritized MIST under this alternative would result in lighter application of fire suppression tactics than Alternatives 2 and 4, and could result in more total acres burned and sagebrush destroyed in the near-term. In the long-term, the potential for large wildfires may be reduced due to less soil disturbance and cheatgrass spread relative to Alternatives 2 and 4. Leaving unburned islands of vegetation within fire containment lines would enhance natural revegetation of burned areas, but may result in some fires escaping beyond containment lines.

4.3.3 Effects of Alternative 2 (No Action)

Lands and Minerals: Current management allows for new ROWs and mineral material sites. Processing applications for these developments would now consider Reserve resources, but weeds would likely invade and native plants be destroyed during and after construction.

Roads: Approximately 259 miles of roads and trails on the Reserve are available for use by all DOE-ID authorized users. Along with Alternative 4, this alternative would have the highest levels of annual disturbance due to road maintenance and use, and the most weed spread due to roads.

Noxious and Invasive Plants: The INEEL conducts weed spraying of known noxious weed infestations as budgets allow. No vehicles are washed prior to entering the INEEL. The spotted knapweed seeds contained in the Birch Creek winter return water flow enter the Reserve only a short distance before being directed to the T-28 North gravel pit.

Revegetation: Revegetation of disturbances on the Reserve would continue to allow the use of commercially available seed cultivars. This would minimize the cost and increase the speed of revegetation projects relative to Alternatives 1 and 3. Planting commercial cultivars of native species would introduce non-endemic genetics to the native plant communities that could lead to unnatural long-term changes to the plant community.

Livestock: Native vegetation has been degraded at livestock concentration areas and while these do not account for significant acreages, they do provide locations for weed establishment. Cattle movement from Wigwam Butte Allotment into the other allotments and the non-grazed area would continue due to insufficient fencing. This would continue the spread of weeds and cheatgrass due to cattle grazing. There are no limitations on imported feed quality and it is unknown if weeds have been imported with stock feed.

Wildlife habitat: Actions proposed for wildlife habitat under this alternative would have no effect on plant communities.

Surface water: Winter return water flows from the Birch Creek Hydropower diversion pass though the edge of the Reserve, and back to the T-28 North gravel pit. This imports spotted knapweed seeds a smaller distance into the Reserve than under the other Alternatives. There is currently no riparian vegetation on the Reserve.

Wildfire: Formation of the INEEL Wildland Fire Management Committee would provide monitoring and mitigation of fire and fire suppression impacts. However, without addition of the Sagebrush Management Committee and the use of Resource Advisors, this alternative would allow for heavier application of suppression tactics than Alternatives 1 and 3. In the short-term, this would likely result in fewer total acres burned and sagebrush destroyed. However, in the long-term, the increased soil disturbance would likely increase the spread of cheatgrass, causing larger and more frequent fires in the future.

4.3.4 Effects of Alternative 3 (Enhanced Natural Resource Protection)

Management actions proposed for **Lands and Minerals, Noxious and Invasive Plants, Revegetation, Surface water and Wildfire** under this alternative would have the same effects as under Alternative 1.

Roads: Limiting access to only authorized research vehicles on 165 miles (64%) of unpaved roads would reduce soil disturbance due to road use and maintenance. Weed spread would be reduced by proportional amounts. This alternative would limit use of more miles of road than the other alternatives.

Livestock: Extension of the boundary fence between Wigwam Butte and Mahogany Butte allotments would reduce weed spread and potential riparian impacts by livestock in lower Birch Creek. Requiring certified weed-free hay would eliminate the possibility importing weeds contained in stock feed. Restoration of some livestock concentration areas would reduce the threat of weed invasion by an amount proportional to the acres restored. In the long-term, retiring grazing permits would remove all impacts due to livestock grazing on the native ecosystem of the Reserve.

4.3.5 Effects of Alternative 4 (Enhanced Opportunity for Resource Extraction)

Management actions proposed for **Lands and Minerals, Roads, Revegetation,** would have the same effects as under Alternative 2.

Noxious and Invasive Plants: Establishment of an IWM program would increase effectiveness of weed control and reduce total acres of noxious and invasive plants the same as Alternatives 1 and 3. Not requiring washing of vehicles would result in more new weed invasion than under Alternatives 1 and 3. With no evaluation and restoration of crested wheatgrass stands under this alternative, this non-native species would continue to expand into native plant communities on the Reserve.

Livestock: Increasing stocking rates on the Sinks, Wigwam Butte and Twin Buttes Allotments by a total of 183 AUMs would increase grazing on approximately 24% of the Reserve. This would increase the size of the livestock concentration areas and the introduction and spread of weeds relative to the other alternatives. Implementation of herding of cattle on the Sinks and Wigwam Butte Allotments, or 19% of the Reserve and fencing the remainder of the Wigwam Butte Allotment boundary would partially mitigate these impacts. Requiring certified weed-free hay would be particularly important under this alternative due to increased presence of herders on the cattle allotments. Increased livestock grazing may reduce the potential for fire spread in the short-term.

Wildlife habitat: Actions proposed for wildlife habitat under this alternative would have no effect on plant communities.

Surface water: The effects of surface water management under this alternative would be the same as under Alternative 1.

Wildfire: Formation of the Reserve Management Committee and use of Resource Advisors would improve monitoring and mitigation of wildfire and fire suppression. This would also create a higher level of awareness of Reserve resources than under Alternative 2. However, heavier application of suppression tactics would impact those resources more than under Alternatives 1 and 3. In the short-term, this alternative would likely result in fewer acres of sagebrush burned than under Alternatives 1 and 3, due to heavier application of fire suppression tactics. In the long-term, with increased disturbance due to fire suppression and the resulting increased cheatgrass spread, this alternative could lead to larger and more frequent fires.

4.3.6 Summary of Effects on Native Plant Communities

Alternative 1: Management actions under this alternative to eliminate new ROWs and gravel pits, reduce road use, increase weed control efforts, restore livestock concentration areas, control livestock distribution, reestablish riparian vegetation, and minimize soil disturbance by wildfire suppression would, in combination, provide a large amount of protection of native ecosystems, but not as much as Alternative 3.

Alternative 2: Existing INEEL restrictions on land use have allowed for development of pre-European settlement conditions in plant communities on most of the Reserve, but potential exists for future degradation. Under current management new power lines, pipelines and mineral material pits may be developed, all roads and tracks remain in use, insufficient effort is made for weed control, non-endemic plants are imported, livestock concentration areas remain degraded, livestock graze in unauthorized areas, no riparian vegetation exists, and fire suppression minimally considers ecological resources. With no change in management, the sagebrush steppe communities on the Reserve would likely degrade in the long-term.

Alternative 3: Most management actions under this alternative are the same as under Alternative 1 with slightly more roads being limited to only authorized research vehicles. The major difference between the alternatives is the potential to purchase and retire grazing permits from operators willing to sell. In spite of any intensive management that could be implemented, livestock compete with wildlife for forage

and water, they import and spread weeds, they destroy native plants where they concentrate and they negatively affect riparian zones. Typically, livestock reduce fire hazard by removal of fine fuels, but the light grazing on the Reserve is insufficient to realize this benefit. Removal of livestock grazing would remove many threats to the native sagebrush steppe ecosystems and potentially benefit native plant communities the most.

Alternative 4: Management actions under this alternative to increase weed control efforts, restore livestock concentration areas, and reestablish riparian, in combination, would provide increased protection of sagebrush steppe plant communities. Increasing livestock grazing, while potentially reducing fine fuels and fire spread in the short-term, would likely cause increased cheatgrass spread in the long-term as would heavier application of fire suppression tactics. These would lead to less protection of sagebrush steppe than both Alternatives 1 and 3.

4.4 Effects of Alternatives on Wildlife Habitat

4.4.1 Management Considerations

DOE policy is to manage all land and resources under the principles of ecosystem management and sustainable development (DOE 1994). This philosophy directs management toward maintaining habitats rather than managing specific wildlife species. By maintaining the sagebrush steppe plant communities in good condition the wildlife species using them are also provided for.

The bald eagle is the only listed (Threatened) species documented on the Reserve, where use is primarily during the winter months. These large birds are often seen perching on power poles and rely mainly on carrion while on the Reserve. Historic bald eagle use of the Reserve was likely limited to the few cottonwood trees that lined the Birch Creek channel before the creek diversion in the early 1900's.

Returning any of the water from the Birch Creek Hydropower diversion to the Reserve would benefit wildlife habitat by re-establishing some riparian on the Reserve. The amount re-established and degree of benefit to wildlife would depend upon specific location of the reintroduced flows and the timing and volume of water returned.

Management to protect the habitat of sagebrush dependent species is important to reduce the chances that these species become listed as Threatened or Endangered. Sage grouse have received the most attention and guidelines for habitat management have been published (Connelly et al., 2000). The guidance contained in these guidelines has been incorporated into management actions throughout this management plan and is presented in Appendix 2.

Research has shown that raptor densities increase following construction of power transmission lines, especially in open areas such as the INEEL (APLIC, 1996). The structures increase perching, roosting and/or nesting habitat for a variety of birds, including special status raptors such as the bald eagle, golden eagle, ferruginous hawk, great horned owl and red-tailed hawk. The increased numbers of predators is likely putting increase pressure on the prey populations, including many special status species. The Reserve has approximately 31.5 miles of active high voltage power lines. There is also one abandoned line along Lincoln Boulevard with approximately 16 poles remaining and two artificial nesting structures.

4.4.2 Effects of Alternative 1 (The Proposed Action)

Lands and Minerals: Eliminating all new ROWs and mineral material development would benefit wildlife species by retaining native vegetation, minimizing weed invasion, the level of human activity and

creation of new raptor perches at potential sites. This would affect at least 200 acres of permitted material sites and an undetermined potential development area.

Roads: Limiting access to only authorized research vehicles on 154 miles (59%) of unpaved roads would reduce use and soil disturbance due to road maintenance. Habitat fragmentation, human disturbance and lost native vegetation would decrease over time as vegetation reestablishes on the road surfaces. Ferruginous hawks would particularly benefit from the lower levels of human disturbance.

Noxious and Invasive Plants: Establishment of an IWM program would reduce total acres of noxious and invasive plants and their effects on wildlife habitat relative to Alternative 2. In addition, vehicle washing and replacement of some crested wheatgrass stands under this alternative would minimize the negative effects of invasive plants on wildlife habitat relative to the other alternatives.

Revegetation: The effects of requiring mostly local plants for revegetation on wildlife habitat quality are undetermined, but retaining only endemic species and avoiding possible long-term changes to the native plant communities would not diminish long-term wildlife habitat quality. Slower plant establishment on revegetation projects would temporarily reduce habitat quality for longer periods of time, but this is not expected to affect large acreages.

Livestock: Addition of 12.4 miles of boundary fence would keep livestock in the Wigwam Butte Allotment. This would reduce weed spread by livestock in lower Birch Creek and eliminate competition for forage with elk in that area. The fence would have some effect on pronghorn and deer movement, but this would be minimized by fence design. Requiring certified weed-free hay would also reduce importation of weeds. Restoration of some livestock concentration areas would reduce the threat of weed invasion and improve wildlife habitat by an amount proportional to the acres restored. This alternative would provide the most benefits to wildlife due to livestock management actions, unless grazing permits were to be retired as under Alternative 3.

Wildlife habitat: Eliminating the use of raptor perches on active and inactive power poles would reduce habitat for many perching birds, including bald eagles, golden eagles, ferruginous hawks, great horned owls and red-tailed hawks. Habitats for all of these special status species would return to levels that existed prior to power line construction. Prey populations, also including many special status species, would be provided more opportunity to increase. These affects are the same for Alternatives 1 and 3.

Surface water: Returning winter Birch Creek flows to the lower channel would replace an unknown amount of sagebrush community with riparian vegetation. This would likely encompass a few 10's of acres loss of sagebrush and gain of riparian. The added riparian would benefit a wide variety of wildlife species in proportion to the amount of riparian created.

Wildfire: Formation of the Reserve Management Committees and use of Resource Advisors under Alternatives 1, 3, and 4 would improve monitoring, mitigation of fire and fire suppression impacts, and awareness of Reserve resource values relative to Alternative 2. Application of prioritized MIST under this alternative would result in lighter application of fire suppression tactics on some fires, less soil disturbance and cheatgrass spread, and less habitat fragmentation than under Alternatives 2 and 4. However, lighter application of suppression tactics could also result in more total acres burned, wildlife habitat altered and sagebrush destroyed in the near-term. The lower amounts of soil disturbance and the accompanying reduced cheatgrass spread could result in smaller, less frequent fires in the future. Leaving unburned islands of vegetation within fire containment lines would enhance reestablishment of wildlife habitat within burned areas relative to Alternative 2, but may result in some fires escaping beyond containment lines.

4.4.3 Effects of Alternative 2 (No Action)

Lands and Minerals: Potential exists for at least 200 acres of mineral material development and an unknown amount of ROW development. Human caused disturbance and loss of wildlife habitat would continue on the areas disturbed by these projects.

Roads: Habitat fragmentation due to roads, disturbance of wildlife by vehicles, and increased potential for weed invasion would remain on all 259 miles of roads. This is the same under Alternatives 2 and 4.

Noxious and Invasive Plants: The current INEEL weed program would reduce but not minimize impacts from weeds to wildlife habitat. No management addressing non-noxious invaders, including crested wheatgrass or cheatgrass is conducted. No vehicles are washed prior to entering the INEEL. This alternative would result in the greatest degradation of wildlife habitat by invasive plants.

Revegetation: The possible long-term changes to the native plant communities due to introduction of non-endemic plants may diminish habitat quality, but the effects on wildlife are uncertain. Revegetation rates would be faster under this alternative due to faster establishment of commercial cultivars, but this is not expected to affect large acreages.

Livestock: The existing boundary fence between Wigwam and Mahogany Butte Allotments is insufficient to control livestock movement. Existing stock water tanks on adjacent BLM land has likely benefited wildlife as there is no perennial water on the Reserve. Habitat quality has been degraded at the livestock concentration areas and while these do not cover significant acreages, they do provide scattered locations favorable for weed invasion. There have been no limits placed upon imported feed quality and it is unknown if weeds have been imported with stock feed.

Wildlife habitat: No active power lines have been modified to eliminate raptor perching. The Reserve contains approximately 31.5 miles of active high voltage power lines with about 230 support structures. Approximately 16 additional unused, unmodified power poles are on the Reserve with two of these containing artificial nesting platforms.

Surface water: Winter return flows for the Birch Creek Hydropower provide water when availability is not critical to wildlife and the ditch supports no riparian vegetation. Current benefits for wildlife on the Reserve are minimal.

Wildfire: The INEEL Wildland Fire Management Committee would provide over-site of wildfire activities without the benefit of a Reserve Management Committee or Resource Advisors. This would result in the lowest degree of awareness of Reserve resources during and after wildfire suppression activities. Application of MIST under this alternative, would be at the discretion of incident commanders without the advise of Resource Advisors, would likely result in a heavier application of fire suppression tactics, more soil disturbance and cheatgrass spread, and more habitat fragmentation than under Alternatives 1 and 3. However, heavier application of suppression tactics could also result in fewer acres burned, wildlife habitat altered and sagebrush destroyed in the short-term. The higher amounts of soil disturbance and the accompanying cheatgrass spread could result in larger, more frequent fires in the future. Burning out unburned islands of vegetation within fire containment lines would remove sources of seed for natural reestablishment of wildlife habitat within burned areas, but would reduce the chances for some fires escaping beyond containment lines.

4.4.4 Effects of Alternative 3 (Enhanced Natural Resource Protection)

Management actions proposed for **Lands and Minerals, Noxious and Invasive Plants, Revegetation, Wildlife Habitat, Surface water and Wildfire** under this alternative would have the same effects as under Alternative 1.

Roads: Limiting access to only authorized research vehicles on 165 miles (64%) of unpaved roads would reduce road use and soil disturbance due to road maintenance. Weed spread would be reduced by proportional amounts. This alternative would limit use of more miles than any other alternative.

Livestock: In the near-term, this alternative would have the same effects as Alternative 1. However, in the long-term, retiring grazing permits would remove all conflicts with wildlife due to livestock grazing on the Reserve.

4.4.5 Effects of Alternative 4 (Enhanced Opportunity for Resource Extraction)

Management actions proposed for **Revegetation** and **Surface water** under this alternative would have the same effects as under Alternative 1.

Management actions proposed for **Lands and Minerals** and **Roads** under this alternative would have the same affects as under Alternative 2.

Noxious and Invasive Plants: Implementation of IWM would reduce the acreage of weed infestation relative to Alternative 2, but with no requirements for vehicle washing, new weed infestations would be more frequent than under Alternatives 1 and 3. Crested wheatgrass stands would continue to spread as under Alternative 2. This alternative would result in greater degradation of wildlife habitat by invasive plants than Alternatives 1 and 3, but less than Alternative 2.

Livestock: Increasing stocking levels on three of the four allotments would increase conflicts with wildlife on approximately 24% of the Reserve. The size of the livestock concentration areas would increase. Competition for forage and increased spread of weeds and cheatgrass would degrade wildlife habitat conditions. Implementation of herding of cattle on the Sinks and Wigwam Butte Allotments, or 19% of the Reserve and completing fencing of the allotment boundary would partially mitigate these impacts. Requiring certified weed-free hay would be particularly important under this alternative due to increased presence of herders on the cattle allotments.

Wildlife habitat: With no modification of active power lines, raptors would continue to use the poles as in Alternative 2. Removal of abandoned power poles would reduce predation by raptors near the 16 unused power poles along Lincoln Boulevard.

Wildfire: Formation of the Reserve Management Committee and use of Resource Advisors under Alternative 1, 3, and 4 would improve monitoring and mitigation of fire and fire suppression impacts relative to Alternative 2. This would also ensure a higher level of awareness of Reserve resources among fire suppression personnel. Use of Resource Advisors would help locate containment lines to minimize direct impacts to high value resources, but without the application of MIST under this alternative, there would be heavier application of fire suppression tactics to keep fires small. This would allow for more soil disturbance, cheatgrass spread, and habitat fragmentation than under Alternatives 1, 2 and 3, but potentially less destruction of critical habitats than under Alternative 2. The higher amounts of soil disturbance and the accompanying cheatgrass spread could result in larger, more frequent fires in the future. Leaving fewer unburned islands of vegetation within fire containment lines would slow reestablishment of wildlife habitat within burned areas, but may result in fewer fires escaping beyond containment lines than under Alternative 1 and 3.

4.4.6 Summary of Effects on Wildlife Habitat

Alternative 1: Management actions under this alternative to reduce road use, increase weed control efforts, restore livestock concentration areas, reestablish riparian, and minimize soil disturbance by wildfire suppression would, in combination, provide increased protection of wildlife habitat. The reduction of perching habitat would reduce habitat for a number of species, including the threatened bald eagle, but prey species, including sage grouse would benefit. Large numbers of power poles remain available to perching species within the region, but outside of the Reserve. Addition of approximately 12.4 miles of fence would affect pronghorn and deer movement and may slightly increase mortality. This alternative would not provide as much protection of wildlife habitat as Alternative 3.

Alternative 2: Existing INEEL restrictions on land use have lead to sagebrush steppe ecosystems in near pre-European settlement conditions on most of the Reserve, but potential exists for future degradation. Under current management new power lines, pipelines and mineral material pits may be developed, all roads and tracks remain in use, insufficient effort is made for weed control, non-endemic plants are seeded, livestock concentration areas continue in degraded condition, power lines attract unnatural numbers of predators, no riparian exists, and fire suppression minimally considers ecological resources. With no change in management, the habitat value of the Reserve would likely degrade in the long-term.

Alternative 3: Most management actions under this alternative are the same as under Alternative 1. Slightly more miles of road would limited to research access only, but the major difference is the potential to purchase and retire grazing permits from willing sellers. In spite of any intensive management that could be implemented, livestock compete with wildlife for forage and water, they import and spread weeds, and they destroy native plants at concentration areas. Livestock typically reduce fire hazard by removal of fine fuels, but the degree of grazing on the Reserve is too low to realize this benefit. Removal of livestock grazing from the Reserve would remove many potential threats to the sagebrush steppe habitat that currently exists. This alternative would provide the highest degree of protection to wildlife habitats.

Alternative 4: Management actions under this alternative to increase weed control efforts, restore livestock concentration areas, and reestablish riparian, in combination would provide much habitat protection. However, increasing livestock grazing and using more aggressive fire suppression tactics would reverse most of these benefits resulting in less protection of wildlife habitat than under Alternatives 1 and 3.

4.5 Effects of Alternatives on Soils and Air Quality

4.5.1 Management Considerations

Wildfire and its aftermath are the most significant factor affecting air quality on the Reserve. Emissions of smoke during the fire and production of dust from landscapes denuded by fire and fire containment lines all have significant impacts on air quality. In addition to health hazards posed by dust inhalation, high levels of dust production also clogs air filtration systems at INEEL facilities and limits public visibility on Highways 22, 28, and 33. Particulate weekly concentrations as high as 500 micrograms per cubic meter of air have been measured at the Test Reactor Area in dust following wildfire. This compares to 25 microgram per cubic meter for a typical weekly average (DOE, 2002).

Fire containment lines remove all combustible plant material, leaving bare soil vulnerable to wind erosion. Under severe burning conditions, dozer lines of one or several blade widths can lead to significant areas being prone to dust production. While minimizing the size of fires will reduce the

potential for dust production, over construction of fire containment lines can also increase dust production, but generally not as much as large burned areas.

The fine textured loess and lacustrine derived soils common on the Reserve are highly prone to accelerated wind erosion when disturbed. Erosion rates of 200 tons/acre/year are typical for measurements conducted by the BLM on burned land in and around the INEEL (DOE, 2002). While this erosion rate far exceeds annual rates of soil formation for the Reserve, natural fire return intervals of over 50 years would allow for replenishment of soils during the long fire-free period. With the spread of cheatgrass and the resulting reduction of fire intervals, fire free periods become shorter and episodes of severe erosion become more frequent. In the long-term this reduces soil productivity and the ability of the site to support vegetation.

In their undisturbed state, soils on the Reserve are covered with either vascular plants or microbiotic crusts. Also known as biological, cryptogamic, cryptobiotic, or microphytic soil crusts, these nonvascular plant communities occupy areas between established vascular plants which would otherwise be bare (Belnap et al., 2001). The crusts function as living mulch by retaining soil moisture, reducing soil erosion, fixing nitrogen and contributing to soil organic matter content (Eldridge and Green, 1994). Microbiotic crusts are easily destroyed by human activity and once removed require several years to reform.

Protecting soils and minimizing dust production requires maintenance or reestablishment of vegetative cove. In addition to fire, displacement of native plants by weeds, localized concentrated grazing, roads, off road driving and mineral material development sites all increase the potential for accelerated wind erosion and dust production. Management of these to limit the extent and duration of soil disturbance minimizes the potential for wind erosion and dust production.

4.5.2 Effects of Alternative 1 (The Proposed Action)

Lands and Minerals: Eliminating new mineral material sites or ROW developments would eliminate potential new sources of soil erosion and dust production. Restoration of some existing pits and ROWs would reduce the potential for dust production created on some roads and mineral material pits.

Roads: Limiting access to only authorized research vehicles on 154 miles (59%) of unpaved roads would reduce road use and soil disturbance due to road maintenance. This would increase vegetative cover and reduce soil erosion rates and dust production. This alternative limits access on fewer miles than Alternative 3, but more than Alternative 2 and 4.

Noxious and Invasive Plants: Most species of noxious weeds provide insufficient vegetative cover to protect soils from accelerated erosion and dust production. Implementation of IWM and vehicle washing requirements under this alternative and Alternative 3 would result in the minimum acres of weed infestation and potential for accelerated erosion and dust production.

Revegetation: Restricting species to local genotypes would likely delay plant reestablishment on some restoration projects. This would allow for more erosion and dust production than under Alternatives 2 and 4. Allowing for the use of all authorized species would reduce this effect in rare situations.

Livestock: Restoration of problem livestock concentration areas would reduce soil erosion and dust production by an amount proportional to the acreage restored. Completion of boundary fencing between Wigwam and Mahogany Butte Allotments would reduce livestock use of unauthorized areas and reduce cheatgrass and weed spread. This would reduce the chances of fire and the accompanying smoke, accelerated soil erosion and dust production in that area relative to Alternative 2.

Wildlife habitat: Wildlife management actions proposed under this alternative would have no effect on soils or air quality.

Surface water: Returning a portion the power plant outflows to the Birch Creek channel has the potential to increase noxious weed infestations along the creek, leaving infested areas prone to erosion and dust production. Implementation of IWM would minimize this weed spread equally under Alternatives 1, 3, and 4.

Wildfire: Use of the Reserve Management Committee and Resource Advisors on fires would improve monitoring and mitigation of fire and fire suppression. These actions would also increase awareness of Reserve resources relative to Alternative 2. Application of prioritized MIST under this alternative would result in lighter application of fire suppression tactics than Alternatives 2 and 4. This would reduce soil disturbance due to fire containment lines and the accompanying cheatgrass spread. While this could cause more total acres burned, soil erosion and dust production in the near-term, the long-term result could be smaller fires due to less cheatgrass spread.

4.5.3 Effects of Alternative 2 (No Action)

Lands and Minerals: Continued development of mineral material sites and ROWs would increase the amount of ground surface disturbed by these activities. This would allow increased accelerated soil erosion and dust production proportional to the acreage affected.

Roads: Currently, all 259 miles of unpaved roads and tracks are used by INEEL staff. Road maintenance levels, weed spread rates, soil erosion rates and dust production would remain at current rates.

Noxious and Invasive Plants: While some spraying is conducted, **c**urrent levels of weed control on the Reserve do not minimize weed infestations. There is also no limitation on off-road and construction vehicles carrying weed seeds onto the Reserve. With no change in management, larger weed infestations would cause more accelerated soil erosion and dust production than under Alternatives 1 and 3.

Revegetation: Revegetation of disturbances on the Reserve would continue to allow the use of commercially available seed cultivars, minimizing the cost and increasing the speed of revegetation projects relative to Alternatives 1 and 3. This would reduce the potential for restored areas to remain bare to be vulnerable to accelerated soil erosion and increased dust production.

Livestock: The existing fence between Wigwam Butte and Mahogany Butte Allotments allows cattle to access the Mahogany Butte Allotment and the non-grazed area. Birch Creek now contains significant amounts of cheatgrass which, if spread, would increase the chances of fire and the accompanying smoke, accelerated soil erosion and dust production in that area.

Wildlife habitat: Wildlife management actions proposed under this alternative would have no effect on soils or air quality.

Surface water: Keeping the winter power plant return flows in the existing ditch would minimize, but not eliminate, the spread of noxious weed seeds from this source on the Reserve. Continuing to direct the entire flow to the T-28 North gravel pit would continue to increase the volume of water leaving the pit and continued construction of water spreading structures outside of the Reserve. The soil and plant disturbance outside of the Reserve would increase the potential for soil erosion and dust production in that area.

Wildfire: The newly created INEEL Wild Land Fire Management Committee would improve monitoring and mitigation of fire and fire suppression impacts. However, with no Resource Advisors under this alternative, Incident Commanders would not have the benefit of the additional knowledge base provided. This would likely lead to heavier application of suppression tactics, increasing soil disturbance relative to the other Alternatives. In the short term, this would likely result in fewer total acres burned, accelerated soil erosion and dust produced. However, in the long-term, the increased soil disturbance would likely increase the spread of cheatgrass, causing larger and more frequent fires in the future.

4.5.4 Effects of Alternative 3 (Enhanced Natural Resource Protection)

Management actions proposed for **Lands and Minerals, Noxious and Invasive Plants, Revegetation, Surface water** and **Wildfire** under this alternative would have the same effects as under Alternative 1.

Roads: Limiting access to only authorized research vehicles on 165 miles (64%) of unpaved roads would reduce use and soil disturbance due to road maintenance. Reducing road use would increase vegetative cover and reduce soil erosion rates and dust production. This alternative limits road use the most.

Livestock: In addition to the benefits identified under Alternative 1, retirement of livestock permits would further reduce accelerated soil erosion and dust production. All livestock concentration areas and stock trails would revegetate, noxious weeds and cheatgrass would spread at slower rates, and vehicle traffic would be lower to non-existent on many roads without the permitees tending their herds.

Wildlife habitat: Wildlife management actions proposed under this alternative would have no effect on soils or air quality.

4.5.5 Effects of Alternative 4 (Enhanced Opportunity for Resource Extraction)

Management actions proposed for **Revegetation** and **Surface water** under this alternative would have the same effects as under Alternative 1.

Management actions proposed for **Lands and Minerals** and **Roads** under this alternative would have the same effects as under Alternative 2.

Noxious and Invasive Plants: No implementation of controls on vehicles entering the Reserve would allow weed importation to continue from this source.

Livestock: Increasing to the maximum allowable livestock stocking would cause this alternative to have the highest impacts to soils and air quality due to livestock. Stock concentration areas and would likely increase in area, and noxious weeds and cheatgrass would likely spread faster.

Wildlife habitat: Wildlife management actions proposed under this alternative would have no effect on soils or air quality.

Wildfire: Use of a Resource Advisor under this alternative would result in less impact to Reserve ecological and cultural resources than under Alternative 2, but heavier application of suppression tactics than under Alternatives 1 and 3. In the short-term, this alternative would likely result in fewer acres burned and less accelerated soil erosion and dust production than under Alternatives 1 and 3, because of heavier use of suppression tactics and smaller fires. However, in the long-term, with increased

disturbance due to fire suppression and the resulting increased cheatgrass spread, this alternative could lead to larger and more frequent fires.

4.5.6 Summary of Effects on Soils and Air Quality

Alternative 1: Management actions under this alternative to reduce road use, increase weed control efforts, restore livestock concentration areas, control livestock distribution and minimize soil disturbance by wildfire suppression would, in combination, increase protection of plants and soil surfaces, but not as much as under Alternative 3. With the exception of large fires, the disturbances on the Reserve produce small amounts of dust relative to the cultivated lands both east and west of the INEEL. Most changes on the Reserve would therefore have little effect on regional air quality. Should a large fire occur on the Reserve, large amounts of dust could be temporarily produced from the burned area and degrade regional air quality. The chances for large fires are higher in the near-term, but lower in the long-term under this alternative, relative to Alternatives 2 and 4.

Alternative 2: With the exception of large fires, the disturbances on the Reserve produce small amounts of dust relative to the cultivated lands both east and west of the INEEL and have little effect on regional air quality. Under current management, new power lines, pipelines and mineral material pits may be developed, all roads and tracks remain in use, insufficient effort is made for weed control, livestock concentration areas continue as degraded habitat, livestock distribution is not well controlled and fire suppression minimally considers ecological resources. With no change in management, the plant communities on the Reserve would likely degrade in the long-term with increased fire frequency and size, accelerated soil erosion and dust production.

Alternative 3: With the exception of large fires, the disturbances on the Reserve produce small amounts of dust relative to the cultivated lands both east and west of the INEEL. Most management actions under this alternative are the same as under Alternative 1. More miles of unpaved road have use limitations, but the major difference is the potential to purchase and retire grazing permits from willing sellers. In spite of any intensive management that could be implemented, livestock import and spread weeds and cheatgrass, and they create bare ground where they concentrate. Typically, livestock reduce fire hazard by removal of fine fuels, but the light grazing on the Reserve is insufficient to realize this benefit. Removal of livestock grazing from the Reserve would remove many potential threats to increase fire size and the amount of bare ground on the Reserve. The long-term potential for accelerated soil erosion and dust production would be the least under this alternative.

Alternative 4: With the exception of large fires, the disturbances on the Reserve produce small amounts of dust relative to the cultivated lands both east and west of the INEEL. Management actions under this alternative to increase weed control efforts and restore livestock concentration areas would provide increased protection of soils and reduce potential for dust production. However, increasing livestock grazing and heavier application of fire suppression tactics would reverse this resulting in less protection of plants and soils than both Alternatives 1 and 3.

4.6 Effects of Alternatives on Social and Economic Resources

4.6.1 Management Considerations

When considering natural resource issues, analysis of economic values offers a consistent measure in dollars for comparison of alternatives. However, the majority of natural resources on the Reserve such as tribal values, native plant communities, wildlife habitat and research opportunity are not easily quantifiable. It is usually these more nebulous values that are at the center of disagreement over allocations of natural resources. Conflicts between users of the Reserve are likely to occur as people

value the same resources for different types of use, especially when one activity negatively impacts potential for other uses. Therefore, comparison of economic valuations is not a complete answer but is one consideration decision makers use to weigh alternatives and trade-offs when making decisions concerning natural resource allocations.

The quantifiable resources on the Reserve are livestock grazing, commercial ROWs and big game hunting. Many researchers have shown that economic benefits to local economies from grazing income are greater than the direct economic values derived from grazing on Federal allotments (Van Tassell and Richardson, 1998 and others). Taylor (2002) calculated values of $60.56 for cattle AUMs and $39.67 for sheep AUMs on Federal allotments in Uinta County Wyoming. This includes direct profits by producers and multipliers for their expenditures in the economy. In addition, each cattle AUM supported 0.000774 local jobs and each sheep AUM supported 0.000938 jobs. Using these numbers, the grazing on the Reserve provides the following values to local economies under the alternatives considered.

Table 9. Economic values of livestock grazing by alternative.

		Wigwam Butte (Cattle)	Sinks (Cattle)	Twin Buttes (Sheep)	Mahogany Butte (Sheep)	Totals
Alternative 1	Active AUM's	642	253	263	471	1629
	Annual Federal Receipts	$808.92	$318.78	$331.38	$593.46	$2,052.54
	Total value added	$38,879	$15,321	$10,433	$18,684	$83,317
	Jobs supported	0.50	0.20	0.25	0.44	1.39
Alternative 2	Active AUM's	642	253	263	471	1629
	Annual Federal Receipts	$808.92	$318.78	$331.38	$593.46	$2,052.54
	Total value added	$38,879	$15,321	$10,433	$18,684	$83,317
	Jobs supported	0.50	0.20	0.25	0.44	1.39
Alternative 3	AUM's with retirement of grazing permits	0	0	0	0	0
	Annual Federal Receipts	0	0	0	0	0
	Total value added	0	0	0	0	0
	Jobs supported	0	0	0	0	0
Alternative 4	AUM's at full preference	686	342	313	471	1812
	Annual Federal Receipts	$864.36	$430.92	$394.38	$593.46	$2,283.12
	Total value added	$41,544	$20,711	$12,416	$18,684	$93,355
	Jobs supported	0.53	0.26	0.29	0.44	1.52

Annual income for the Federal Treasury is derived through leases for livestock grazing and ROWs on the Reserve. Leases for the Reserve portions of the four Federal allotments would generate the values shown in Table 9. The Reserve portion of the 230 KV Utah Power and Light power line and the two buried fiber-optic lines rent for a total of approximately $3,718.68 (BLM files). The INEEL power lines and the State highways pay no rental fees on Federal land.

High voltage 230 KV transmission lines cost between $160,000 and $200,000 per mile to construct. Requiring any potential new lines to route around the Reserve could add to construction costs. In addition, adding raptor protection devices to the existing line would cost approximately $1,000 per pole or a total of $81,000. These increased costs would be passed on to regional power consumers through slight increases in utility costs.

Portions of the Reserve are open to big game hunting by the public. The generally accepted value to the economy of this activity is $44.12 per hunter-day (ASA 1996). There are no records of the number of hunter-days generated by the Reserve.

4.6.2 Effects of Alternative 1 (The Proposed Action)

Lands and Minerals: Eliminating new mineral material sites within the Reserve would increase haul distances and costs for highway maintenance projects conducted within the Reserve. Eliminating new utility ROWs on the Reserve would require utility companies to route any future power lines around the Reserve, potentially increasing their costs. Opportunities to generate additional Federal lease rental fees from ROWs on the Reserve would be forgone.

Roads: Limiting access to only authorized research vehicles on 154 miles (59%) of unpaved roads may increase operating costs for grazing permittees by limiting vehicle access to their herds. This increase would be the most for the sheep herders on the Mahogany Butte Allotment. Less that 2% of the Twin Buttes Allotment is on the Reserve, so herding costs would be minimally affected there. Potential for increased permittee costs would be minimized by using horses for herding. Hunter days on the Reserve may decrease slightly due to fewer road miles available. Road maintenance costs for the INEEL would be reduced with fewer miles of roads remaining in use.

Noxious and Invasive Plants: Implementation of IWM would increase short-term operating costs for the INEEL, but could provide additional jobs for local qualified weed control personnel. Requiring off-road and construction vehicles to process through the bus washing station would increase costs for vehicle operators and INEEL staff at the wash facility. Long-term increases in weed control costs would be less due to less weed expansion than under Alternative 2.

Revegetation: Generally requiring use of only locally collected seeds and transplants would increase the costs of revegetation projects for the INEEL several fold, relative to Alternatives 2 and 4. Development of a local seed collection industry could add diversity to the economy and create additional job opportunities.

Livestock: Retaining current livestock numbers would continue to contribute $83,317 per year to the local economy and $2,052 in Federal grazing receipts. This is the same as Alternative 2, but more than Alternative 3 and less than 4. Extension of the boundary fence between Wigwam Butte and Mahogany Butte Allotments would cost approximately $5,000 per mile or a total of $62,000. Fence maintenance costs would increase for the permitees.

Wildlife habitat: Addition of devices to prevent raptor perching on active power poles could cost approximately $1,000 per pole or $159,000 total. Of this, approximately 51% would be on the privately owned line, with the remainder being a cost to the INEEL. Removal of artificial raptor perch platforms and other inactive power poles would cost INEEL approximately $4,000 to $5,000, but would have little effect on the local economy.

Surface water: Diverting a portion of the Birch Creek Power return flows would cost INEEL an undetermined amount depending upon the type of system designed. These cost increases would be

partially offset by reduced costs for water diversions below the T-28 Pit. All of this work would be on the INEEL and not affect the local economy.

Wildfire: Emphasizing use of the MIST fire suppression method may cause some fires to be larger than under Alternatives 2 and 4. This could reduce forage available for grazing for 1 to 3 years following fire. There would also be increased potential for power line destruction and for fires to burn from the Reserve onto adjacent lands. While this may lead to increased suppression and restoration costs, using MIST could reduce suppression costs. In the long-term, using MIST could decrease weed control costs and the potential for cheatgrass caused increased fire risk. Increases or decreases in fire suppression costs could affect local economies through changes in hiring of fire fighters and local purchase of supplies.

4.6.3 Effects of Alternative 2 (No Action)

Lands and Minerals: Applications for mineral material permits and ROWs would continue to be processed. Highway project costs within the Reserve would not be affected by gravel availability.

Roads: With no restrictions on authorized road uses, income and costs would not change for livestock herding, road maintenance and hunting.

Noxious and Invasive Plants: Weed control would continue to be done as INEEL budgets allow. No money is expended to wash vehicles entering the INEEL. The short-term cost savings would likely lead to long-term increased costs of weed control and fire suppression due to weed and cheatgrass spread.

Revegetation: Allowing the use of commercially grown cultivars of native species would minimize the costs to the INEEL of revegetation projects under this and Alternative 4.

Livestock: Retaining current levels of livestock grazing would continue to add $83,317 per year to the local economy and $2,052 in Federal grazing receipts. This is the same as Alternative 1, more than Alternative 3 and less than under Alternative 4. Operating costs for permittees would not change.

Wildlife Habitat: Wildlife management activities on the Reserve currently have little or no affect on local economies.

Surface water: Leaving the Birch Creek Power return flows in the existing ditch would cause increases in the long-term INEEL costs for weed control and flood prevention.

Wildfire: Less use of MIST would reduce fires sizes in the short-term compared to Alternatives 1 and 3. While Incident Commanders are required to consider using MIST, they may be more likely to use heavy-handed suppression methods without a Resource Advisor. This could reduce the chances for power line destruction and for fire to burn from the Reserve onto adjacent lands. While this could reduce suppression and restoration costs in the near-term, long-term costs of weed control and fire suppression would likely increase. Increases or decreases in fire suppression costs could affect local economies through changes in local purchase of supplies and contracting.

4.6.4 Effects of Alternative 3 (Enhanced Natural Resource Protection)

Management actions proposed for **Lands and Minerals, Noxious and Invasive Plants, Revegetation, Wildlife Habitat, Surface water and Wildfire** under this alternative would have the same effects as under Alternative 1.

Roads: Limiting access to only authorized research vehicles on 165 miles (64%) of unpaved roads would reduce use the most, under this alternative, with economic effects potentially being the highest. Costs for access to livestock herds would increase slightly. This increase would be the most for sheep herders on the Mahogany Butte Allotment. Herding with horses could partially off set these increases. Road maintenance costs for the INEEL and hunter access would be reduced the most under this alternative.

Livestock: Retaining current levels of livestock grazing would continue to add $83,317 per year to the local economy and $2,052 in Federal grazing receipts. If the permittees offer to sell their permits to the Federal Government, these receipts would drop to $0. At $60/AUM, retiring the Reserve portions of the permits would cost approximately the Federal government $99,024 and this amount would be infused into the local economy by the permittee's. Extension of the boundary fence between Wigwam Butte and Mahogany Butte Allotments would cost approximately $5,000 per mile or a total of $62,000, unless the permits are sold. Operating costs on the two cattle allotments would increase due to additional fence maintenance requirements, but there would also be fewer cattle lost on the highways. Purchase of these permits would reduce annual grazing receipts received by the Federal Government by approximately $2,052.00 ($1.26/AUM) per year.

4.6.5 Effects of Alternative 4 (Enhanced Opportunity for Resource Extraction)

Management actions for **Roads** and **Revegetation** under this alternative would have the same effects as under Alternative 2.

Lands and Minerals: Mineral material permits and ROWs continue to be processed, but consider potential for impacts to the goals and objectives of the Reserve.

Noxious and Invasive Plants: Implementation of IWM would increase short-term operating costs for the INEEL, but could potentially provide additional jobs for qualified weed control personnel. Long-term weed control costs would be lower than under Alternative 2, but higher than Alternatives 1 and 3 due to increased weed introduction on vehicles. No additional short-term costs would be required for washing of vehicles entering the INEEL under this alternative.

Livestock: Increasing grazing levels to the full preference would increase income to the local economy to by about $10,038 and increase Federal grazing receipts by to about $163. These are the highest of the alternatives. Operating costs for permittees on Wigwam Butts and Sinks allotments would increase due to increased herding needs.

Wildlife Habitat: Removal of inactive power poles would have little or no affect on the local economy.

Surface water: Impacts under this alternative are the same as under Alternative 1.

Wildfire: Aggressive fire suppression under this alternative would reduce the size of fires in the short-term, but may increase fire size in the long-term due to increased spread of cheatgrass. This could increase INEEL weed control and fire suppression costs in the long-term. These long-term increases would be greatest under Alternative 2 with the most aggressive suppression and less under Alternatives 1 and 3. The addition of a Resource Advisor under this alternative would reduce soil disturbance relative to Alternative 2. Increases or decreases in fire suppression costs could affect local economies through changes in local purchase of supplies.

4.6.6 Summary of Effects on Social and Economic Resources

Alternative 1: The impacts of management changes on the Reserve under Alternative 1 would have little effect on the regional agricultural economy. Income from livestock grazing would remain unchanged, but operating costs on the two cattle allotments would increase slightly due to 12.4 miles of additional fence maintenance requirements. Development of local seed collection practices could add diversity to the economy and create additional job opportunities. The potential for increases in Federal ROW lease receipts would be forgone on the Reserve, but routing power lines and pipelines around the Reserve on other public lands could actually increase Federal receipts due to longer ROWs. These increases, along with requirements for eliminating raptor use of towers could add slightly to regional power costs.

Alternative 2: With no changes in management on the Reserve, the affects on the regional economy would remain the same. This alternative would have the least impact on local economy, utility company and INEEL costs in the near-term, but INEEL costs for fire suppression and weed control would likely be highest in the long-term.

Alternative 3: Impacts to the regional economy could be the greatest under this alternative. If the permitees were to sell the grazing leases, the grazing removed from the Reserve could be moved to other Federal lands, State or private lands, or the operators could reduce the size of their operations. The resulting smaller operations may not be economical and some may go out of business. These changes would affect only the permitees in Wigwam Butte, Sinks and Mahogany Butte Allotments, with a total of five operators. The 15 operators on the Twin Buttes Allotment would likely not be affected due to the low proportion (less than 2%) of this allotment being on the Reserve. In the worst case, if all of the 5 permittees went out of business, their operations would be sold to other operators that would add the private land and attached remaining Federal leases to their operations. This would result in a loss to the local economy of the income now derived from grazing on the Reserve or approximately $83,317 annually and 1.14 full time jobs. Development of local seed collection industry could add additional job opportunities. The potential for increases in Federal ROW lease receipts would be forgone on the Reserve, but routing power lines and pipelines around the Reserve on other public lands could increase Federal receipts due to longer ROWs. These increases, along with requirements for eliminating raptor use of towers could add slightly to regional power costs.

Alternative 4: This alternative has potential to increase inputs to the local economy by the highest amount. Income from grazing would increase by about $10,000 per year and there would be no potential effect on regional power costs. The opportunity for development of local seed collection industry would be forgone.

4.7 Effects of Alternatives on Ecological Research Opportunities

4.7.1 Management Considerations

Ecological research opportunities on the Reserve are dependent upon conserving the plant and wildlife communities and making them available for study. Management to preserve the native flora and fauna of the Reserve is inherent to most provisions of this plan. Significant threats to these communities include invasion by non-native plants, outright killing of native plants by construction and environmental clean-up activities, wildfire and fire suppression, off-road vehicle travel and poor distribution of livestock. Management to reduce these threats is necessary to ensure continued existence of the pre-European settlement conditions now present on the Reserve.

Because of the size and complexity of the Reserve, reasonable vehicle access is essential for conducting cost effective and efficient research. In addition, safety and security aspects of working at a DOE national laboratory require that field workers be able to quickly leave the area should this become necessary.

Impacts of the alternatives on Ecological Research Opportunities are the same as those analyzed under Section 4(C), Effects of Alternatives on Native Plant Communities. Refer to that section for analysis of impacts.

4.8 Cumulative Impacts

Cumulative impacts are the incremental effects caused by management actions considering all other past, present, and reasonably foreseeable future actions affecting a resource. These can result from individually minor but collectively significant actions taken over time and the effects can be either additive or subtract from the effects of other actions.

The effects of managing to preserve native sagebrush steppe ecosystems in this plan reverse the effects of many years of sagebrush steppe conversion and degradation. Eliminating new gravel pits and ROWs, limiting road use and maintenance, purchasing and retiring grazing permits, eliminating non-endemic plants, creating new un-grazed riparian zones, and limiting fire suppression methods all would reverse long-term region trends, if implemented. It is unlikely that any of these measures would represent an incremental portion of a larger change that would affect regional resources significantly.

Installation of devices on power poles to eliminate perching birds could represent a larger shift in management direction. The Sage Grouse Management Guidelines (Connelly et al., 2000; Appendix 3) recommends this course of action in sage grouse habitat and newly constructed power lines on public lands in Wyoming have recently been required to comply (Utah Power and Light, personal communication). Power poles that have created habitat for perching birds, including many special status raptor species could be modified within the region with actions implemented on the Reserve being an incremental portion.

4.9 Mitigation Measures

1. All fences would be constructed to meet standard BLM guidance (BLM Manual Handbook H-1741-1; Karsky, 1988; Connelly et al., 2000) to allow for big game passage and to minimize sage grouse collisions with the fences.

2. Herbicide applications for weed control would be done only by State of Idaho Certified Pesticide applicators. These people would also be required to be trained in plant identification and the need to minimize destruction of non-target plant species on the Reserve.

3. Collection of native seeds and plants for rehabilitation projects would be done in a dispersed manner to minimize impacts to individual plant populations.

4. Off-road vehicular travel would be strictly controlled by the Reserve Management Committee.

4.10 Residual Impacts

1. Where non-paved roads and tracks remain open for use, invasive plants would continue to spread, and soil erosion and dust production would continue. These negative impacts could be exacerbated

by road maintenance and would have the most effect under Alternatives 2 and 4, less under Alternative 1, and the least under Alternative 3.

2. In spite of all measures taken during herbicide application, some degree of damage to non-target plant species can be expected.

3. Reproduction of plants in areas used for seed collection could be reduced.

4. Wherever fences are added, there would be increased risk for big game entanglement in the fence and minor increases in hazards to birds. These risks would be greatest under Alternatives 1, 3 and 4 and smallest under Alternative 2.

5. Where unused power poles are removed, non-predator perching birds would also loose habitat.

5. CONSULTATION AND COORDINATION

5.1 Consultation

During the Scoping phase of the planning process, during comments were received from the public and presentations were also made to several groups.

Comments were receive from: Birch Power—Ted Sorenson, hydropower plant; Idaho Department of Parks and Recreation—Rick Collignon, Director; Committee for Idaho's High Desert and Western Watersheds—Katie Fite and Jon Marvel; INEEL Citizen Advisory Board—David Kipping; Garth Soderquist—Mud Lake Resident; Upper Snake Sage Grouse Local Working Group—Wendy Green Lowe, Facilitator; The North American Grouse Partnership—Kent Christopher; George Woodie—Resident of Howe and livestock permitee.

Presentations were made to: The Fort Hall Tribal Council, the Butte County Commissioners, the Clark County Commissioners, and the Jefferson County Commissioners.

5.2 Interdisciplinary Team Members

Name	Agency/Organization	Resource Specialty
Dick Munoz	FWS	Wildlife/listed species
Steve Schmidt	IDF&G	Wildlife/game species
Bob Jones	DOE-ID	Interagency Coordinator
Gerry Deutscher	FWS	Wildlife
Michael Jackson	INEEL, BBWI	INEEL Infrastructure
Willie Preacher	Sho-Ban Tribe	Native American Concerns
Roger Blew	Stoller, Inc	Vegetation/Fire Ecology
Ken Thacker	BLM	Team lead

The ID team wishes to ewxpress a special thanks to all of the staff at DOE-ID, Stoller, Inc., BBWI, BLM, FWS, USFS and IDF&G who have contributed time to the review and preparation of this document. Many of these people received no funding to support their work on this project, so have gone above and beyond the call of duty with their support.

6. REFERENCES CITED

Anderson, Jay E., and Mark L. Shumar, 1989, *Guidelines for Revegetation of Disturbed Sites at the Idaho National Engineering Laboratory*, DOE/ID-12114, Radiological and Environmental Sciences Laboratory, DOE, Idaho Falls, Idaho.

Anderson, J. E., 1991, *Vegetation studies to support the NPR Environmental Impact Statement*, Final Report to EG&G Idaho, Idaho Falls, Idaho.

_____, K. T. Ruppel, J. M. Glennon, K. E. Holte, and R. C. Rope, 1996, *Plant communities, ethnoecology, and flora of the Idaho National Engineering Laboratory*, Environmental Science and Research Foundation, Idaho Falls, Idaho.

_____, 1999, *The Idaho National Engineering and Environmental Laboratory: An Ecological Treasure of the Upper Snake River Plain,* In: Rangelands 21(5), pp. 11–17.

_____ and R.S. Inouye, 2001, *Landscape-Scale Changes in Plant Species Abundance and Biodiversity of a Sagebrush Steppe over 45 Years,* In: Ecological Monographs, 71 (2), pp.531–556, Ecological Society of America.

ASA, 1996, Economic impacts of Fishing, Hunting and Wildlife-Related Recreation on National Forest Lands. American Sportfishing Association, 1996.

Avian Power Line Interaction Committee (APLIC). 1996. *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996.* Edison Electric Institute and the Raptor Research Foundation. Washington, D.C.

Belnap, J., 1994, *Potential role of cryptobiotic soil crust in semiarid rangelands*, In: Monson, S. B., and Kitchen, eds. Proceedings—Ecology and Management of Annual Rangelands, General Technical Report INT-GTR-313. USDA Forest Service, Intermountain Research Station, Ogden, Ut., pp. 179–185.

Blew, R. D., and K. C. Jones, 1998, *Planting and irrigating influence on post-fire vegetation recovery*. pp. 94–95, In Reynolds, T. D. and R. W. Warren, eds, Environmental Science and Research Foundation annual technical report to DOE-ID: calendar year 1997, ESRF-27. Environmental Science and Research Foundation, Idaho Falls, ID.

Blew, R. D., 1999, *Planting and irrigating effects on vegetation recovery from fire*, pp. 70–71, In Weigmann, D. and R. D. Blew, eds., Environmental Science and Research Foundation annual technical report to DOE-ID: calendar year 1998, ESRF-033, Environmental Science and Research Foundation. Idaho Falls, Idaho.

_____, 2000, *Planting and irrigating effects on vegetation recovery from fire*, In: A. Luft and R.W. Warren, eds., Environmental Science and Research Foundation annual technical report to DOE-ID: calendar year 1999, ESRF-33, Environmental Science and Research Foundation, Idaho Falls, ID, pp. 89–90.

_____, Sue Majors and Amy Forman, 2002, *A Survey Of Vegetation Recovery On Wildfire Containment Lines And An Ecological Evaluation Of Pre-Suppression Firebreak Construction On The INEEL,* S. M. Stoller Corp., Idaho Falls, Idaho.

Box, T. W., 1986, Capstone address. *Crested wheatgrass: it's values, problems and myths; where now?* In: Johnson, K. L., ed. Crested wheatgrass: it's values, problems and myths; symposium proceedings; 1983 October 3–7; Logan, Ut. Logan: Utah State University: 343-345.

Cholewa, Anita F., and Douglas M. Henderson, 1984, *A Survey and Assessment of the Rare Vascular Plants of the Idaho National Engineering Laboratory,* Radiological and Environmental Sciences Laboratory, Idaho Falls, Idaho.

Connelly, J. W., and I. J. Ball, 1982, *Sage grouse Census Methods and Populations in Southeastern Idaho*, In: Idaho National Engineering Laboratory Radioecology and Ecology Programs, 1983 Progress Report, U.S. D.O.E. Idaho Operations Office, Radiological and Environmental Sciences Laboratory. O.D. Markham, Editor. pp

_____, 1982, *Sage grouse on the Idaho National Environmental Research Park,* In Idaho National Engineering Laboratory Radioecology and Ecology Programs, 1983 Progress Report. U.S. D.O.E. Idaho Operations Office, Radiological and Environmental Sciences Laboratory. O. D. Markham, Editor

Connelly, J. W., M. A. Schroeder, A. R. Sands, and C. E. Braun, 2000, *Guidelines to manage sage grouse populations and their habitats*, Wildlife Society Bulletin, 28(4):967-985.

Crosthwaite, E. G., C. A., Thomas, and K. L. Dyer, 1970, *Water Resources in the Big Lost River Basin, south-central Idaho*: U.S. Geological Survey Open-File Report 70-93.

DOE, 1994, *National Environmental Research Parks*, Department of Energy, Office of Scientific and Technical Information, Oak Ridge, Tenn.

DOE, 2002, *Draft Idaho National Engineering and Environmental Laboratory Wildland Fire Management Environmental Assessment*, DOE/EA-1372. U.S. Department of Energy Idaho Operations Office, Idaho Falls.

Eldridge, D. J., and R.S.B. Green, 1994, *Microbiotic soil crusts: a review of their roles in soil and ecological processes in the rangelands of Australia,* Australian Journal of Soil Research 32:389-415.

Elliot, K., and A. White, 1987, *Competitive effects of various grasses and forbs on ponderosa pine seedlings*, Forest Science. 33: 356-366.

Hironaka, M. M., M. Fosberg, and A. Winward,1983, *Sagebrush-grass habitat types of southern Idaho.* Bulletin 35, Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow, Idaho, USA.

Hunn, Eugene S., 1990, *Nch'I-Wana, Big river: mid-Columbia Indians and their Land.* Seattle, WA: University of Washington Press, p. 378.

IASS, 2002, *Idaho Agricultural Statistics Service* website: http://www.nass.usda.gov/id., December 2002.

ICDC, 2002, *Idaho Department of Fish and Game, Conservation Data Center* website, http://www2.state.id.us/fishgame/info/cdc/rare.htm, April, 2002.

Jones, T. A., 1997, *In*: Shaw, Nancy L.; Roundy, Bruce A. comps, 1997, *Proceedings: Using seeds of native species on Rangelands*; 1997 February 16–21; Rapid city, SD, Gen. Tech. Rpt. INT-GTR-372, Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station.

Karsky, R., 1988, *Fences*, Range Structural Equipment handbook 5E4D31, Prepared by the Missoula Technology & Development Center, Missoula Montana, pp. 210.

Koslow, K. N., 1984, *Hydrological Characterization of Birch Creek Basin*, EGG-PB-6782.

Lewis, S. M., Michael, D. L., Theye, J. K., Troutman, R. E., Coherly, D. M. and P. H. Townsend, 1996, *Workplan for Waste Area Group 1 Operable Unit 1-10*, Comprehensive Remedial Investigation/Feasibility Study, USDOE-DOE Idaho Operations Office, DOE-ID-10527, Book 1.

Maier, A. M., B. L. Perryman, R. A. Olson, and A. L. Hild, *2001 Climatic influences on recruitment of 3 subspecies of Artemisia tridentate*, Journal of Range Management 54:699-703.

McBride, R., N. R. French, A. H. Dahl, and J. E. Demeter, 1978, *Vegetation types and surface soils of the Idaho National Engineering Laboratory Site*, IDO-12084, Radiological and Environmental Sciences Laboratory, U.S. Department of Energy, Idaho Falls, Idaho.

Moritz, W. E., 1988, *Wildlife use of fire-disturbed areas in sagebrush steppe on the Idaho National Engineering Laboratory*, M.S. Thesis, Mont. State Univ., Bozeman, p. 135, (as cited in) Strohmeyer, D. C. and J. M. Peek, 1996, *Wapiti home range movement patterns in a sagebrush desert*. Northwest Sci. 70:2 79-87, (p. 79).

Mosley, R. K. and A. Pitner, 1996, *Rare Bryophytes and Lichens in Idaho: Status of our Knowledge*, Idaho Department of Fish and Game, Conservation Data Center, Boise, Idaho

Noss, R. F., E. T. LaRoe, III, and J. M. Scott, 1995, *Endangered ecosystems of the United States: a preliminary assessment of loss and degradation*, USDI National Biological Service Report 28.

Oberg, P. M., 1970, *Between these Mountains*. Exposition Press, Inc. Jerico, New York.

Olson, G. L., D. J. Jeppsen, and R. D. Lee, 1995, *The status of soil mapping for the Idaho National Engineering Laboratory*, Lockheed Idaho Technologies Co., Idaho Falls, Idaho.

Patrick, S. and J. E. Anderson, 1999, *Fire ecology of the INEEL*. Pages 66-69 In: Weigmann, D. and R. D. Blew, eds., Environmental Science and Research Foundation annual technical report to DOE-ID: calendar year 1998, ESRF-033, Environmental Science and Research Foundation, Idaho Falls, Idaho.

Pellant, M., 1996, *Cheatgrass: the invader that won the west*. Unpublished report, On file with: U.S. Department of Agriculture, Forest Service; U.S. Department of Interior, Bureau of Land Management; Interior Columbia Basin Ecosystem Management Project, 112 E. Poplar, Walla Walla, WA 99362.

Peters, E. F. and S. C. Bunting, 1994, *Fire Conditions Pre- and Postoccurrence of Annual Grasses on the Snake River Plain, In:* Proceedings-ecology and management of annual rangelands, S. B. Monsen and S. G. Kitchen, compilers, pp. 31–36, USDA Forest Service General Technical Report INT-GTR-31`3, Ogden, Utah, USA.

Powell, G., M. Pitt, B. Wikeem, 1994, *Effect of forest seeding on early growth and survival of lodgepole pine.* Journal of Range Management, 47:379-384.

Pyke, D. A. and S. J. Novak, 1994, Cheatgrass Demography—Establishment Attributes, Recruitment, Ecotypes, and Genetic Variability, *In:* Proceedings-ecology and management of annual rangelands. S. B. Monsen and S. G. Kitchen, compilers, pp. 12–21, USDA Forest Service General Technical Report INT-GTR-31`3, Ogden, Utah, USA.

_____, 1996, *Rangeland seedings and plantings: exotics or natives?* In: Edge, W. D.; Olsen-Edge, S. L. Editors. Proceedings—sustaining rangeland ecosystems symposium; 1994 August 29-31; La Grande, Or. SR953, Corvallis, Or. Oregon State University: 32-44.

_____, 1999, *Invasive Exotic Plants in Sagebrush Ecosystems of the Intermountain West,* In Proceedings: Sagebrush Steppe Ecosystems Symposium. Bureau of Land Management Publication No. BLM/ID/PT-001001+1150, Boise, Idaho, USA.

Quigley, Thomas M., and Sylvia J. Arbelbide, tech. eds., 1997, *An Assessment of Ecosystem Components in the Interior Columbia Basin and portions of the Klamath and Great Basins*, Volume II, Gen. Tech. Rep. PNW-GTR-405, Portland, Or: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, 4 Vol. (Quigley, Thomas M., tech. ed.; The Interior Columbia Basin Ecosystem Management Project: Scientific Assessment).

Ratzlaff, T. D. and J. E. Anderson, 1995, *Vegetal recovery following wildfire in seeded and unseeded sagebrush steppe*, Journal of Range Management 48:386-391.

Reynolds, T. D., J. W. Connelly, D. K. Halford, and W. J. Arthur, 1986, *Vertebrate fauna of the Idaho National Environmental Research Park,* Great Basin Naturalist, 46(3):513-527.

Ringe, Brenda L., 1993, *In:* Environmental Resources Document for the Idaho National Engineering Laboratory, John S. Irving, Principal Investigator, Idaho National Engineering Laboratory, E.G.&G., Inc. Idaho Falls, Idaho.

Sather-Blair, Signe, P. Makela, T. Carrigan and L. Anderson, 2000, A Framework to assist in making Sensitive Species Habitat Assessments for BLM-Administered Public Lands in Idaho, USDI, BLM. Boise, Idaho.

Shallat, T. and Burke, L. Editors, 1994, *Snake, The Plain and it's People*, Boise State University, Boise, Idaho.

Sheley, R. L., S. Kedzie-Webb, and B. D. Maxwell, 1999, *Integrated Weed Management in Rangeland, In*: Biology and Management of Noxious Rangeland Weeds, Oregon State University Press, Corvallis, Oregon.

Sperber, T. D., T. D. Reynolds, and R. P. Breckenridge, Editors, 1998, *In:* Proceedings: *Developing the scientific basis for supporting long-term management of the Idaho National Engineering and Environmental Laboratory.*

Taylor, David, 2002, *Economic white paper presented to Uita County, Wyoming*, University of Wyoming. November 2002.

U.S. Census Bureau, 2002, *U.S. Census 2000*, United States Census Bureau website www.census.gov.

USDA, 1999, *Soil Taxonomy, A Basic System of Soil Classification for Making and Interpreting Soil Surveys,* Agriculture Handbook 436, U.S. Government Printing Office, Washington D.C. 20402

USDA, NRCS, 2002, *The PLANTS Database*, Version 3.5 (http://plants.usda.gov), National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Van Tassell, L. W. and J. W. Richardson, 1998, *Impacts of Federal Grazing Reductions on Wyoming Ranches, Stubble Height and Utilization Measurements: Uses and Misuses*, Oregon State University, Agricultural Experiment Station Bulletin 682, Corvallis, Oregon.

Wagstaff, F. J., and B. L. Welch, 1990, *Rejuvenation of mountain big sagebrush on mule deer winter ranges using onsite plants as a seed source, In*: Proceedings—symposium on cheatgrass invasion, shrub die-off, and other aspects of shrub biology and management, McArthur, E. D.; Romney, E. M., Smith, S. D., Tueller, P. T. comps, Gen. Tech. Rep. INT-276, Ogden, Ut: U.S. Department of Agriculture, Forest Service, Intermountain Research Station: pp. 171–174.

Walker, S. C., R. Stevens, S. B. Monsen, and K. R. Jorgensen, 1995, *Interaction between native and seeded introduced grasses for 23 years following of juniper-pinyon woodlands, In*: Proceedings: wildland shrub and arid land restoration symposium; 1993 October 19–21, Las Vegas, Nev. Gen. Tech. Rpt. INT-157. Ogden, Ut.: U. S. Department of Agriculture, Forest Service, Intermountain Research Station: 372-380.

West, Neil E., 1988, *Intermountain deserts, shrub steppes, and woodlands,* pp. 209–230, *In*: M. G. Barbour and W. D. Billings, editors, North American terrestrial vegetation, Cambridge University Press, New York.

_____, 1999, *Managing for biodiversity of rangelands,* pp. 101–126 in W. W. Collins and C. O. Qualset, editors, Biodiversity in agroecosystems, CRC Press, Boca Raton, Florida, USA.

_____, 2000, *Synecology and Distribution Regimes of Sagebrush Steppe Ecosystems*, In : Proceedings: Sagebrush Steppe Ecosystems Symposium, pp. 15–26, Bureau of Land Management Publication No. BLM/ID/PT-001001+1150, Boise, Idaho.

Wright, H. A., and A. W. Bailey, 1982, *Fire ecology*, John Wiley and Sons, New York.

Young, J. A. and R. A. Evans, 1978, *Population dynamics after wildfires in sagebrush grassland,* Journal of Range Management 31:283-289.

_____, 1989, *Dispersion and Germination of big sagebrush (Artemesia tridentata) seeds,* Weed Science. 37:201-206.

7. GLOSSARY OF TERMS

Abiotic	Nonliving components of an ecosystem such as soil, rock, air and water.
Acre	A unit of land area measurement that is equal to 43,560 sq. ft., a square of approximately 209 feet on each side, a circle with a radius of approximately 118 ft., or .4047 hectars.
Eolian	Deposits of sands and soils moved by the wind.
Allotment	A public land area designated for the use of a prescribed number and kind of livestock under one plan of management.
Annual Plant	A plant that lives for one year; seed germination, plant vegetative growth, reproduction and death all occur within one year.
Alluvium	Sediments deposited by moving waters.
Aquifer	A body of permeable rock that is capable of storing significant quantities of water, that is underlain by an impermeable layer, and through which ground water moves.
Biennial Plant	A plant that lives for two years, producing vegetative growth the first year, flowering and fruiting the second year, and then dying.
Biodiversity	A term used to describe all aspects of biological diversity, especially species richness, ecosystem complexity and genetic variation. Used here to refer only to endemic, native species.
Biological Control	The human use one organism to control another.
Biological Crust	see Microbiotic crust
Browse	(n) That part of leaf and twig growth of shrubs, woody vines and trees available for animal consumption. (v) Act of consuming browse.
Bunchgrass	A perennial grass that grows in an upright, compact bunch of tillers, lacking stolons or rhizomes; there is usually an apparent interspace between adjacent plants, unlike stolon- or rhizome-producing grasses that may grow in root-infused mats or sods.
Burn, Burn Area	An area over which fire has recently passed
Canopy	(1) The visual projection of the aerial portion of vegetation vertically downward, usually expressed as a percent of ground covered. (2) A generic term referring to the aerial portion of vegetation.
Canopy Cover	The percentage of ground covered by a vertical projection of the outermost perimeter of the natural spread of plant foliage that includes small openings within the canopy; cp. *crown.*
Climate	The average or prevailing weather conditions of a place over a period of years, especially the range in seasonal temperatures and precipitation.
Community	A general term applied to any grouping of populations of different organisms found living together in a particular environment.

Competition	The interaction between individual plants or animals for limiting resources they need to survive.
Connectivity (Wildlife)	The arrangement of habitats that allow organisms to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation; the opposite of fragmentation.
Conservation	Sound management within given social and economic constraints that produces goods and services for humans without depleting natural ecosystem diversity, and acknowledging the naturally dynamic character of biological systems.
Corridor (wildlife)	Patches of appropriate vegetation that permit wildlife to move to desirable or preferred habitats.
Cover	Maybe interpreted as the plants and/or plant parts: (1) living or dead, on the surface of the ground; (2) living plants and litter of dead parts of plants; (3) the area of ground cover by plants or one or more species; cp. *basal area*.
Cryptogamic Crust, Cryptobiotic Crust	See: Microbiotic crust.
Cultivar	A named variety, strain, genotype or race within a plant species, distinguished by adaptation and morphological, physiological, cytological or chemical characteristics; the word is derived from “cultivated variety.”
Culture	The transfer of behavioural traits between individuals in a non-genetic manner such as through verbal or visual communication.
Defensible Space	A area where combustible fuels are kept to a minimum in order to make the area easily defended against wild fire.
Density	The number of individuals per unit area.
Desertification	The process by which an area or region becomes more arid through loss of soil and vegetative cover; often accelerated by misuse of resources and drought.
Desired Plant Community	A plant community that produces the kind, proportion and amount of vegetation necessary to meet or exceed objectives established for a specific site. The plant community is consistent with the site’s capability to produce the desired vegetation through management.
Discharge	A measure of the water flow at a particular point, such as at the output of a hydro-power plant.
Disturbance	Refers to events that alter the structure, composition or function of the resource base, causing plant communities to move away from the stable state. Natural disturbances include drought, floods, wind, natural fires and herbivory, and diseases. Unnatural disturbance is human caused and include livestock grazing, road construction and use, human caused fire and the introduction of exotic species.
Diversity	The species richness and relative abundance of species present in an area.
Dominant	Plant species or species groups that, by means of their number, cover or stature, influence or control the presence or absence of associated species.

Ecological Integrity	The level of retention of endemic species and processes within an ecological system.
Ecosystem	A discrete landscape unit that consists of abiotic and biotic components interacting to form a more or less stable system.
Ecosystem Management	The use of an ecological approach to achieve multiple-use management of public lands by blending the needs of people and environmental values so that Forest Service and BLM lands represent diverse, healthy, productive and sustainable ecosystems.
Ecotype	A locally adapted population within a species that has certain genetically determined characteristics; cp. *genotype*.
Effective Moisture	The portion of water in a soil that can be absorbed by plant roots.
Endemic	Native to or restricted to a particular site, area, region or country.
Eradication	Complete kill or removal of an organism from a particular area; generally used in discussing noxious and invasive weeds.
Evolution	Change with continuity in successive generations of organisms.
Exotic	An organism or species that is not native to the region in which it is found.
Extinction	Elimination of a taxon from the community.
Firebreak Fuelbreak	A natural or constructed barrier to the spread of fire; usually created by the removal of vegetation; cp. *fireline*, *fuelbreak*.
Flora	The plants that grow in a specific region or area; a list of the plants
Fluvial	Pertaining to or produced by the action of a stream or river.
Forage	All browse and herbage that is available and acceptable to herbivorous animals, including wildlife and livestock.
Forb	A broad-leafed plant with no woody above ground growth which dies back to the ground surface each year.
Fragmentation (habitat)	The break-up of a large land area, such as sagebrush-steppe, into smaller patches isolated by roads, urban areas or areas converted to a different plant community; the opposite of connectivity.
Fuel (fire)	That portion of the plant community available to burn in a fire.
Genotype	The genetic constitution of an organism, as opposed to its physical appearance (phenotype). This usually refers to a specific set of genes in an organism. Specific allelic composition of a set of genes within individuals of a species that may occur across the range of the species.
Geographical Information System (GIS)	A computer system capable of holding and using data describing places on the earth's surface; an information management system that provides for the entry, storage, manipulation, retrieval and display of spatially oriented data.
Germination	The beginning of growth of a seed, spore, pollen, or other structure, usually in response to favorable environmental conditions and following a period of dormancy.

Global Positioning System (GPS)	A handheld, electronic receiver system that uses satellite transmissions to determine precise latitude and longitude of any location on the earth's surface; GPS data (positions) can be downloaded to a GIS.
Grassland	Ground covered by vegetation dominated by grasses. Correlates with rainfall volumes intermediate between deserts and forests. In the mid-latitudes also know as steppe or prairie, whereas in the tropics called savannah.
Gravel, Cobble, Stone	As defined in Soil Taxonomy (USDA, 1982): Gravel (2mm – 3 inches), cobble (3-10 inches, stones (> 10 inches).
Graze	The consumption of standing biomass (forage) by livestock or wildlife.
Grazing System	Specialized grazing management that defines systematically recurring periods of grazing, deferment and/or rest.
Ground Cover	The area of the ground covered with vegetation when the canopy edge is projected downward perpendicularly.
Ground Water	Subsurface water that is in the zone of saturation; the top level of the ground water is the water table; source of water for wells, seeps, and springs. Compare Effluent water table, Influent water table.
Gully	A feature of surface erosion that develops from concentrated run-off which bites deep into the ground surface by the upstream migration of a headcut or knick point.
Habitat	The living place of an organism or community, characterized by its physical or biotic properties.
Halophyte	A plant that can grow in saline or highly alkaline and sodic soils.
Headfire	Ignition of a fire on the windward (upward) side of a burn resulting in a relatively rapidly moving flame-front, upslope or with prevailing wind direction.
Herbaceous	Nonwoody vegetation such as grasses and forbs.
Herding	The formation of large herbivores into groups of animals having a social organization. Also, the purposeful act of moving herds of animals.
Hydrology	The study of bodies of water on land and how they change with time.
Igneous	The major rock type formed from crystallization of a magma.
Incident Commander	The person on a fire fighting team who is in charge of the team.
Indigenous	Native born, growing or produced naturally in a particular region or country.
Infiltration	The downward entry of water into the soil. also Percolation
Influent Ground Water Table	Ground water that is taken up by the soils that underlay a stream; water flows from the streambed into the ground. An influent stream looses water to the soil's zone of saturation. Influent water tables are commonly found in arid climates. Influent streams may be susceptible to scouring and deeply incised erosion leading to the formation of gullies. Some influent streams may actually lose so much water that they dry up completely.

Integrated Weed Management	The control of weeds by using the combination of management measures which is the most cost effective and least damaging to the natural ecosystem. Can include various combinations of herbicides, biological controls, mechanical control, cultural control, and education.
Introduced Species	A species not a part of the original flora or fauna; most commonly used in revegetation terminology for adapted species from parts of the world other than the western USA.
Invasive Species	A species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.
Keystone species	A species, the presence or abundance of which indicates the extent to which a habitat is being exploited.
Knick point	An abrupt change of gradient within a drainage where surface flowing water imparts high levels of erosive energy on the channel.
Lacustrian	Pertaining to lakes or areas where lakes once existed.
Land Use Planning	The process by which decisions are made on future land uses over extended time periods that are deemed to best serve the general welfare. Decision-making authorities on land uses are usually vested in state and local government units, but citizen participation in the planning process is essential for proper understanding and implementation.
Lek	A breeding area where males of certain species of birds gather together to display in order to attract females.
Lichen	A composite organism consisting of a fungus and an algae or cyanobacteria living in a symbiotic relationship.
Limiting Factor	Any environmental factor that causes organisms to exist at sub-optimal level and thereby prevents an organism from reaching its full biotic potential.
Litter	The uppermost layer of organic debris on the soil surface; essentially the freshly fallen or slightly decomposed vegetal material.
Loess	Unconsolidated, wind-deposited sediments composed largely of silt-sized particles and showing little or no stratification.
Loosing stream	A stream that has a permeable bed through which it looses water flow to the ground water system below.
Management Objective	The objectives for which lands are managed, which includes specified uses accompanied by a description of the desired vegetation or desired future condition and the expected products and/or values.
Management Plan	A program of action designed to achieve a particular set of objectives.
Microclimate	Atmospheric conditions prevailing within a small space, usually influenced by localized influences such as vegetation or surface irregularities.
Microbiotic Crust	A community of non-vascular plants consisting mostly of cyanobacteria, green algae, lichens, mosses, microfungi and other bacteria occupying the surface few centimeters of soils. Also known as biological, cryptogamic, cryptobiotic, or microphytic soil crusts.

Mineral Material	A class of material that is sold by the Federal government through direct sales, as opposed to leased minerals or minerals located by mining claims. Mineral materials are low value per unit volume such as sand, gravel, stone, clay, and soil.
Monitoring	The orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives.
Multiple-Use	Use of land for more than one purpose; i.e., grazing livestock, wildlife habitat, recreation, watershed, etc. Not necessarily the combination of uses that will yield the highest economic return or greatest output per unit.
Mycorrhiza	A symbiotic relationship between a fungus and the roots of a vascular plant. Essential for the survival of some species and favorable for others.
Native Species	A species present or presumed present in an area before the beginning of recorded history. Assumed to have not been imported by man.
Natural community	The community of flora and fauna that would exist at a given location without the influence of man.
Natural resources	Naturally occurring elements generally viewed as having values to man; includes plants, animals, air, water, land, minerals, space, research opportunities, open space.
Naturalized Species	An introduced species that has become adapted and thrives in a new climate, ecological site, or different environment.
Niche	The functional position of an organism in its environment.
Nitrogen fixation	The reduction of gaseous molecular nitrogen, usually from the air, and its incorporation into nitrogenous compounds available to plants.
No-Action Alternative	The most likely condition expected to exist in the future if current management direction were to continue unchanged.
Noxious Weed	An unwanted plant specified by Federal or State regulations as being especially undesirable, troublesome, and difficult to control; often has negative ecological and economic impacts on public lands.
Off Highway Vehicle (OHV)	This designation replaces the off-road vehicle (ORV) designation and is all inclusive of un-surfaced roads; aids in management of seasonal closures on all un-surfaced roads needing protection during wet seasons or for protection of other resources or values.
Organic matter	In particular, the organic material present in soils; more generally, the organic component of an ecosystem.
Opportunistic Species	A species adapted for utilizing variable, unpredictable, or transient environments; cheatgrass is a good example.
Paradigm	A large-scale and generalized model that provides a viewpoint from which the real world may be investigated. It differs from most other models, which are abstractions based on data derived from the real world.
Parent material	The material from which a soil has developed through soil building processes.

Percolation	The downward movement of water through the soil, especially through soil that is saturated or near-saturation.
Perennial Plant	A plant that has a life span of 3 or more years.
Perennial water	A stream, river, spring or lake that contains water for the entire year under most conditions.
Phenotype	The appearance of an individual that would likely be different in a different environment.
Physical factor	An abiotic factor that influences growth and development of biologic organisms.
Pioneer plant	A plant species that occurs early in plant succession. Generally species exhibiting rapid growth, prolific production of easily dispersed seeds, and the ability to germinate and establish on open sites.
Playa	The lowest part of an intermountain basin that is frequently flooded by runoff from adjacent drainages or uplands.
Predation	Interaction between species where one species gains energy by consuming another.
Preservation	Management to keep an entire ecosystem and in its components alive, intact and in their original condition.
Pristine	A state of ecological stability or condition existing in the absence of direct disturbance of humans.
Productivity	A measure of the ability of a site to produce plants, usually expressed in weight per unit area.
Rangeland	Land on which the native vegetation (climax or natural potential) is predominately grasses, grass-like plants, forbs, or shrubs; includes lands revegetated naturally or artificially when routine management of that vegetation is accomplished mainly by manipulation of grazing. Rangeland includes natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes and wet meadows.
Range Condition	A generic term relating to present status of a unit of range in terms of specific values or specified potentials.
Rangeland health	The degree to which the integrity of the soil, vegetation, water and air as well as ecological processes are balanced and sustained.
Relict	Organisms that have survived while other related ones have disappeared. Often refers to species that formerly had a much wider distribution and have survived locally through periods of unfavorable conditions.
Resource Advisor	A position on a fire suppression team that is responsible to advise the Incident Commander on issues surrounding natural resource values that may be threatened by fire or fire suppression activities.
Resource Issue	A subject of interest and discussion that generally involves differing views as to allocations.

Rehabilitation (fire)	The repair of an area burned by wildfire utilizing native and non-native plant species to obtain a stable plant community that will protect the burned area from erosion and invasion by weeds.
Restoration	Holistic actions affecting both the abiotic and biotic components of a system taken to achieve desired, healthy, and functioning conditions and processes. Generally refers to the process of enabling a system to resume acting in a natural way.
Revegetation	Establishing or re-establishing desirable plants in areas where the plant community is not adequate to meet management objectives without intervention.
Right-of-Way	A designated parcel of land, either linear or area in extent, that has been identified through the land use planning process, as the preferred location for existing and future ROWs that are similar, identical or compatible.
Riparian	The portion of a stream or lake shore that contains green vegetation most of the time. Contains vegetation that could not exist in the area without access to freely available water.
Runoff	The total stream discharge of water, including both surface and sub-surface to a stream channel.
Seedbank	Seed stored in the soil that will germinate given adequate conditions. Seeds produced by plants that occupy the site over many years principally build up the seedbank.
Shrub	A plant that has persistent, woody stems, a relatively low growth habit and generally produces several basal shoots instead of a single bole; it differs form a tree by its lower stature; maximum height is generally 3–4 meters (10–15 ft.).
Sod Forming Grasses	Stoloniferous or rhizomatous grasses that form a sod or turf.
Soil Erosion	Movement of soil material by running water, wind, moving ice, or gravitational creep. Natural erosion occurs where natural amounts of erosional processes act upon soils with natural amounts of protection (usually vegetation or rock). Accelerated erosion occurs due to unnatural events, usually human activity, which increases the rates of soil movement.
Soil disturbance	Natural and man caused disruption of the soil surface and/or standing vegetation.
Special Status Species	Species identified as having viability concerns because of significant current or predicted downward trends in (1) population numbers or density or (2) habitat capability that would reduce a specie's existing distribution. Also species identified as culturally important.
Stronghold (wildlife)	Landscapes and watersheds with extensive habitat that: (1) historically supported a particular species, (2) population numbers are stable or increasing and the local population is likely to be at half or more of its historical size and density, and (3) the population or metapopulation contains some minimum number of individuals with a normal age-class structure.

Succession	The sequential change in vegetation and associated animals, either in response to an environmental change or induced by the intrinsic properties of the organisms themselves; colonization of a new physical environment (site) by a series of plant & animal, seral communities until a final, equilibrium state is reached, which maybe 'climax'; new species modify conditions that eventually permit the replacement of one community by another.
Understory	The plants that grow under the canopy of other plants; usually refers to grasses, forbs and low shrubs growing under trees or larger shrubs.
Watershed	The area of land from which a surface watercourse or a groundwater system derives its water.
Water Table (Influent)	Ground water that recharges by surface water that infiltrates and percolates into the soil below the stream, typical of arid and semi-arid regions.
Weed	Any plant growing where unwanted, a plant that has a negative impact within a given management system.
Wildland Fire, Wildfire	Any fire, regardless of ignition source, that is burning outside of prescription or any fire burning on public lands or threatening public resources, where no fire prescription standards have been prepared.

Appendix A

Proclamation for the INEEL Sagebrush Steppe Ecosystem Reserve

Appendix A

Proclamation for the INEEL Sagebrush Steppe Ecosystem Reserve

To the People of Idaho:

We are proud to designate approximately 73, 263 acres within the Idaho National Engineering and Environmental Laboratory (INEEL) as an important sagebrush plant community to be managed for its unique biological attributes and the enjoyment and scientific benefits of future generations. This acreage will be known as the "INEEL Sagebrush Steppe Ecosystem Reserve."

The Reserve is a valuable ecological resource unique to the intermountain west and contains lands that have had little human contact for over 50 years. The Sagebrush Steppe Ecosystem across its entire range was listed as a critically endangered ecosystem by the national Biological Service in 1995, having experienced greater than a 98% decline since European settlement.

The Reserve provides inspiring vistas, important habitat, and home to some 270 vertebrate species throughout different parts of the year. A few of the more notable wildlife species include prairie falcons, sage grouse, sage sparrows, sage thrasher, pronghorn antelope, coyotes, badgers, bobcats, marmot and weasels. Species of public and regulatory concern using this ecosystem include bald eagle, ferruginous hawk, Northern loggerhead shrike, burrowing owl, pygmy rabbit and Townsends's big-eared bat. Over 400 plant species, of which over 85% are native, include sagebrush, rabbit brush, numerous native wheatgrasses, Indian ricegrass, squirreltail, and others which are all interrelated in this unique sagebrush region.

We support the designation of the INEEL Sagebrush Steppe Reserve as a unique area needing special management considerations. We are signing this proclamation to assure that the area receives special scientifically controlled consideration. Conservation management in this area is intended to maintain the current plant community and provide the opportunity for study of an undisturbed sagebrush steppe ecosystem. Knowledge gained from these opportunities may help others understand what can be done to rehabilitate other ecologically unique sagebrush steppe areas in the west.

Traditional rangeland uses, which currently exist on a portion of the area, will be allowed to continue under this management designation. These lands are improving in ecological condition under their current management program and will provide the opportunity to study the "how and why" for these improvements. We also recognize and support options for future uses of the INEEL and other portions of its buffer zone, including the potential development of space initiatives.

This Proclamation signed between the Department of Energy (Department), the Bureau of Land Management (BLM), the U.S. Fish and Wildlife Service (Service), and the State of Idaho, Department of Fish and Game (IDFG), designates the Reserve as unique, and to be managed and protected for future generations. The DOE, BLM and Service have signed a Memorandum of Agreement that outlines the overarching details for the development of a Natural Resources Management Plan (NRMP) for the Reserve. The BLM will be the lead agency in preparing the plan with the Service providing technical guidance for the preparation of the NRMP. The BLM will assure that the Shoshone-Bannock Tribes will be involved in the development of the Plan. Additionally, all other interested stakeholders will also be invited to participate in the development of the plan. Work on this plan will commence no later than 90 days from signing of this document.

BLM will provide technical assistance and lead in the areas of land and multiple use management. The IDFG will work with the Service in addressing animal population needs. DOE-ID will provide data from existing data sets and knowledge of the area after 50 years of history on the site.

We will continue to collaboratively explore different options for the most effective way to federally protect this parcel, including the opportunity for the DOI to assign special designation under one of its authorized authorities. Our goal is to ensure that this land is protected and maintained as a natural area and as a resource for the People of Idaho.

This document was signed on July 17, 1999 by Secretary of Energy Bill Richardson, (for) the Regional Director, Region 1 U.S. Fish and Wildlife Service by Richard Munoz, (for) the State Director of Idaho, Bureau of Land Management by Elena Daly, (for) the Interim Director, Idaho Fish and Game by Don Wright.

Appendix B

Rankings for Special Status Species

Appendix B

Rankings for Special Status Species

U.S. Fish and Wildlife Service/National Marine Fisheries Service

Experimental, nonessential (XN)—Ranking currently applied to two reintroduced species: the gray wolf (south of I-90) and the whooping crane.

Watch (W)-(1)—Species that are stable but with Idaho populations that are on the periphery of their range, (2) Idaho population is disjunct but appears stable, (3) unique habitat, or the species is an indicator of a specific habitat type, or (4) the status of the species is poorly understood.

Species of Concern (SC)—An informal term for a species whose conservation status may be of concern to the USFWS and that might be in need of concentrated conservation actions. Such species do not receive any legal protection under ESA. Designation as an SC does not necessarily mean that the species will eventually be proposed for listing.

Candidate (C)—Species proposed for listing as either threatened or endangered.

Threatened (T)—Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Endangered (E)—Any species which is in danger of becoming extinct throughout all or a significant portion of its range.

Natural Heritage Program /Conservation Data Center

Global rank indicator (G)—denotes rank based on range wide status.

Trinomial rank indicator (T)—denotes rangewide status of infraspecific taxa.

State rank indicator (S)—denotes rank based on status within Idaho.

1 = Critically imperiled because of extreme rarity or because some factor of its biology makes it especially vulnerable to extinction (typically 5 or fewer occurrences).

2 = Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (typically 6 to 20 occurrences).

3 = Rare or uncommon but not imperiled (typically 21 to100 occurrences).

4 = Not rare and apparently secure, but with cause for long-term concern (usually more than 100 occurrences).

Example of Use:

G4T2 = species is apparently secure range wide, but this particular subspecies or variety is imperiled.

Idaho Native Plant Society Rankings

State Priority (1)—Taxa in danger of becoming extinct or extirpated from Idaho in the foreseeable future if identifiable factors contributing to their decline continue to operate; these are taxa whose populations are present only at critically low levels or whose habitats have been degraded or depleted to a significant degree.

State Priority (2)—Taxa likely to be classified as Priority 1 within the foreseeable future in Idaho, if factors contributing to their population decline or habitat degradation or loss continue.

Sensitive (S)—Taxa with small populations or localized distributions within Idaho that presently do not meet the criteria for classification as Priority 1 or 2 but whose populations and habitats might be jeopardized without active management or removal of threats.

Monitor (M)—Taxa that are common within a limited range as well as those taxa which are uncommon but have no identifiable threats.

Review (R)—Global and State rare taxa which may be of conservation concern in Idaho but for which insufficient data exists upon which to base a recommendation regarding appropriate classification.

BLM Rankings

Sensitive Species (S)—Taxa (1) that are under status review by U.S. Fish and Wildlife Service/National Marine Fisheries Service, (2) whose numbers are declining so rapidly that Federal listing might become necessary, (3) with typically small and widely dispersed populations, or (4) inhabiting ecological refugia or other specialized unique habitats.

Watch List (W)—Species whose populations and range appear to be restricted, but information is lacking as to the cause or the species is indeed heading towards extinction and in need of management action to reduce or remove threats.

Appendix C

Guidelines to Manage Sage Grouse Populations and their Habitats[a]

a. From Connelly et al., 2000.

Appendix C

Guidelines to Manage Sage Grouse Populations and their Habitats

The following is the portion of the guidelines applicable to migratory sage grouse populations.

Definitions

For the purpose of these guidelines, we define an occupied lek as a traditional display area in or adjacent to sagebrush-dominated habitats that has been attended by ≥2 male sage grouse in ≥2 of the previous 5 years. We define a breeding population as a group of birds associated with one or more occupied leks in the same geographic area separated from other leks by >20 km. This definition is somewhat arbitrary but generally based on maximum distances females move to nest.

Breeding habitat management

For both migratory and non-migratory populations, lek attendance, nesting, and early brood rearing occur in breeding habitats. These habitats are sagebrush-dominated rangelands with a healthy herbaceous understory and are critical for survival of sage grouse populations. Mechanical disturbance, prescribed fire, and herbicides can be used to restore sage grouse habitats to those conditions identified as appropriate in the following sections on habitat protection. Local biologists and range ecologists should select the appropriate technique on a case-by-case basis. Generally, fire should not be used in breeding habitats dominated by Wyoming big sagebrush if these areas support sage grouse. Fire can be difficult to control and tends to burn the best remaining nesting and early brood rearing habitats (i.e., those areas with the best remaining understory), while leaving areas with poor understory. Further, we recommend against using fire in habitats dominated by xeric mountain big sagebrush (*Artemesia tridentata xericensis*) because annual grasses commonly invade these habitats and much of the original habitat has been altered by fire (Bunting et al., 1987).

Although mining and energy development are common activities throughout the range of sage grouse, quantitative data on the long-term effects of these activities on sage grouse are limited. However, some negative impacts have been documented Braun, 1998; Lyon, 2000). Thus, these activities should be discouraged in breeding habitats, but, when unavoidable, restoration efforts should follow procedures outlined in these guidelines.

Habitat protection

1. Manage breeding habitats to support 15-25% canopy cover of sagebrush, perennial herbaceous cover averaging ≥18 cm in height with ≥15% canopy cover for grasses and ≥10% for forbs and a diversity of forbs (Barnett and Crawford, 1994; Drut et al., 1994a; Apa, 1998) during spring. Habitats meeting these conditions should have a high priority for wildfire suppression and should not be considered for sagebrush control programs. Sagebrush and herbaceous cover should provide overhead and lateral concealment from predators. If average sagebrush height is >75 cm, herbaceous cover may need to be substantially greater than 18 cm to provide this protection. There is much variability among sagebrush-dominated habitats (Tisdale and Hirondaka, 1981; Hironaka et al., 1983) and some Wyoming sagebrush and low sagebrush breeding habitats may not support 25% herbaceous cover. In these areas, total herbaceous cover should be ≥15 %. Further, the herbaceous height requirement may not be possible in habitats dominated by grasses that are relatively short when mature. In all of these cases, local biologists and range ecologists should

develop height and cover requirements that are reasonable and ecologically defensible. Leks tend to be relatively open, thus cover on leks should not meet these requirements.

2. For migratory populations, identify and protect breeding habitats within18 km of leks in a manner similar to that described for non-migratory sage grouse. For migratory sage grouse, leks generally are associated with nesting habitats but migratory birds may move >18 km from leks to nest sites. Thus, protection of habitat within 3.2 km of leks may not protect most of the important nesting areas (Wakkinen et al., 1992;Lyon, 2000).

3. In areas of large-scale habitat loss ($\geq$40% of original breeding habitat), protect all remaining habitats from additional loss or degradation. If remaining habitats are degraded, follow guidelines for habitat restoration listed below.

4. During drought periods ($\geq$2 consecutive years), reduce stocking rates or change management practices for livestock, wild horses and wild ungulates if cover requirements during the nesting and brood rearing periods are not met. Grazing pressure from domestic livestock and wild ungulates should be managed in a manner that, at all times, addresses the possibility of drought.

5. Suppress wildfires in all breeding habitats. In the event of multiple fires, land management agencies should have all breeding habitats identified and prioritized for suppression, giving the greatest priority to breeding habitats that have become fragmented or reduced by >40% in the last 30 years.

6. Adjust timing of energy exploration, development, and construction activity to minimize disturbance of sage grouse breeding activities. Energy-related facilities should be located $\geq$3.2 km from active leks whenever possible. Human activities within view of or <0.5 km from leks should be minimized during the early morning and late evening when birds are near or on leks.

Habitat restoration

1. Before initiating vegetation treatments, quantitatively evaluate the area proposed for treatment to ensure that it does not have sagebrush and herbaceous cover suitable for breeding habitat. Treatments should not be undertaken within sage grouse habitats until the limiting vegetation factor(s) has been identified, the proposed treatment is known to provide the desired vegetation response, and land use activities can be managed after treatment to ensure that vegetation objectives are met.

2. Restore degraded rangelands to a condition that again provides suitable breeding habitat for sage grouse by including sagebrush, native forbs (especially legumes), and native grasses in reseeding efforts (Apa, 1998). If native forbs and grasses are unavailable, use species that are functional equivalents and provide habitat characteristics similar to those of native species.

3. Where the sagebrush overstory is intact but the understory has been degraded severely and quality of nesting habitat has declined, use appropriate techniques (e.g., brush beating in strips or patches and interseed with native grasses and forbs) that retain some sagebrush but open shrub canopy to encourage forb and grass growth.

4. Do not use fire in sage grouse habitats prone to invasion by cheatgrass and other invasive weed species unless adequate measures are included in restoration plans to replace the cheatgrass understory with perennial species using approved reseeding strategies. These strategies could

include, but are not limited to, use of pre-emergent herbicides (e.g., Oust®, Plateau®) to retard cheatgrass germination until perennial herbaceous species become established.

5. When restoring habitats dominated by Wyoming big sagebrush, regardless of the techniques used (e.g., prescribed fire, herbicides), do not treat >20% of the breeding habitat (including areas burned by wildfire) within a 30-year period (Bunting et al., 1987). The 30-year period represents the approximate recovery time for a stand of Wyoming big sagebrush. Additional treatments should be deferred until the previously treated area again provides suitable breeding habitat. In some cases, this may take <30 years and in other cases >30 years. If 2,4-D or similar herbicides are used, they should be applied in strips such that their effect on forbs is minimized. Because fire generally burns the best remaining sage grouse habitats (i.e., those with the best understory) and leaves areas with sparse understory, use fire for habitat restoration only when it can be convincingly demonstrated to be in the best interest of sage grouse.

6. When restoring habitats dominated by mountain big sagebrush, regardless of the techniques used (e.g., fire, herbicides), treat $\leq$20% of the breeding habitat (including areas burned by wildfire) within a 20-year period (Bunting et al., 1987). The 20-year period represents the approximate recovery time for a stand of mountain big sagebrush. Additional treatments should be deferred until the previously treated area again provides suitable breeding habitat. In some cases, this may take <20 years and in other cases >20 years. If 2,4-D or similar herbicides are used, they should be applied in strips such that their effect on forbs is minimized.

7. All wildfires and prescribed burns should be evaluated as soon as possible to determine if reseeding is necessary to achieve habitat management objectives. If needed, reseed with sagebrush, native bunchgrasses, and forbs whenever possible.

8. Until research unequivocally demonstrates that using tebuthiuron and similar acting herbicides to control sagebrush have no long-lasting negative impacts on sage grouse habitat, use these herbicides only on an experimental basis and over a sufficiently small area that any long-term negative impacts are negligible. Because these herbicides have the potential of reducing but not eliminating sagebrush cover within grouse breeding habitats, thus stimulating herbaceous development, their use as sage grouse habitat management tools should be examined closely.

The pertinent sections of the sage grouse guidelines regarding management of winter habitat for sage grouse follow:

Winter habitat management

Sagebrush is the essential component of winter habitat. Sage grouse select winter use sites based on snow depth and topography and snowfall can affect the amount and height of sagebrush available to grouse (Connelly, 1982; Hupp and Braun, 1989; Robertson, 1991). Thus, on a landscape scale, sage grouse winter habitats should allow grouse access to sagebrush under all snow conditions.

Habitat protection

1. Maintain sagebrush communities on a landscape scale, allowing sage grouse access to sagebrush stands with canopy cover of 10–30% and heights of at least 25–35 cm regardless of snow cover. These areas should be high priority for wildfire suppression and sagebrush control should be avoided.

2. Protect patches of sagebrush within burned areas from disturbance and manipulation. These areas may provide the only winter habitat for sage grouse and their loss could result in the extirpation of the grouse population. They also are important seed sources for sagebrush re-establishment in the burned areas. During fire suppression activities do not remove or burn any remaining patches of sagebrush within the fire perimeter.

3. In areas of large-scale habitat loss (≥40% of original winter habitat), protect all remaining sagebrush habitats.

Habitat restoration

1. Reseed former winter range with the appropriate subspecies of sagebrush and herbaceous species unless the species are re-colonizing the area in a density that would allow recovery within 15 years.

2. Discourage prescribed burns >50 ha and do not burn >20% of an area used by sage grouse during winter within any 20–30 year interval (depending on estimated recovery time for the sagebrush habitat).

General Habitat Management from the Sage Grouse Guidelines:

General habitat management

The following guidelines pertain to all seasonal habitats used by sage grouse.

1. Monitor habitat conditions and only propose treatments if warranted by range condition (i.e., the area no longer supports habitat conditions described in the following guidelines under habitat protection). Do not base land treatments on schedules, targets, or quotas.

2. Use appropriate vegetation treatment techniques (e.g., mechanical methods, fire) to remove junipers and other conifers that have invaded sage grouse habitat (Commons et al., 1999). Whenever possible, use vegetation control techniques that are least disruptive to the stand of sagebrush, if this stand meets the needs of sage grouse.

3. Increase the visibility of fences and other structures occurring within one km of seasonal ranges by flagging or similar means if these structures appear hazardous to flying grouse (e.g., birds have been observed hitting or narrowly missing these structures or grouse remains have been found next to these structures).

4. Avoid building powerlines and other tall structures providing perch sites for raptors within 3 km of seasonal habitats. If these structures must be built, or presently exist, the lines should be buried or poles modified to prevent their use as raptor perch sites.

References cited

Apa, A. D., 1998, Habitat use and movements of sympatric sage and Columbian sharp-tailed grouse in southeastern Idaho. Dissertation, University of Idaho, Moscow, USA.

Barnett, J. F., and J. A. Crawford, 1994, *Pre-laying nutrition of sage grouse hens in Oregon*. Journal of Range Management 47:114-118.

Braun, C. E., 1998, *Sage grouse declines in western North America: what are the problems?* Proceedings of the Western Association of State Fish and Wildlife Agencies 78:139-156.

Bunting, S. C., B. M. Kilgore, and C. L. Bushey, 1987, *Guidelines for prescribed burning sagebrush-grass rangelands in the northern great basin,* United States Department of Agriculture, Forest Service, General Technical Report INT-231, Ogden, Utah, USA.

Commons, M. L., R. K. Baydack, and C. E. Braun, 1999, *Sage grouse response to pinyon-juniper management,* pp. 238–239 *in* S. B. Monson and R. Stevens, compilers, Proceedings; ecology and management of pinyon-juniper communities, United States Department of Agriculture, Forest Service, RMRS-P9, Fort Collins, Colorado, USA.

Connelly, J. W., Jr., 1982, *An ecological study of sage grouse in southeastern Idaho,* Dissertation, Washington State University, Pullman, Washington, USA.

Hironaka, M., M. A. Fosberg, and A. H. Winward, 1983, *Sagebrush-grass habitat types of southern Idaho.* Idaho Forest, Wildlife and Range Experiment Station, Bulletin 35, Moscow, Idaho, USA.

Hupp, J. W., and C. E. Braun, 1989, *Topographic distribution of sage grouse foraging in winter,* Journal of Wildlife Management 53:823-829.

Lyon A. G., 2000, *The potential effects of natural gas development on sage grouse (Centrocercus urophasianus) near Pinedale, Wyoming,* Thesis, University of Wyoming, Laramie, Wyoming, USA.

Robertson, M. D., 1991, *Winter ecology of migratory sage grouse and associated effects of prescribed fire in southeastern Idaho,* Thesis, University of Idaho, Moscow, Idaho, USA.

Tisdale, E. W., and M. Hironaka, 1981, The sagebrush-grass region: a review of the ecological literature. Idaho Forest, Wildlife, and Range Experiment Station, Bulletin 33, Moscow, Idaho, USA.

Wakkinen, W. L., K. P. Reese, and J. W. Connelly, 1992, *Sage grouse nest locations in relation to leks,* Journal of Wildlife Management 56:381-383.